

Report for:

Campbell Reith

The Heights School, Mapledurham

Air Quality Assessment

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1. INTRODUCTION

ACCON UK Limited (ACCON) have been commissioned by Campbell Reith Hill LLP to carry out an air quality assessment to support a planning application for the proposed Heights Primary School, Mapledurham. The proposed development consists of a primary school with capacity for 420 pupils and associated recreational areas.

The site is located to the south of the A4074 Upper Woodcote Road on existing playing fields which are bounded by existing residential properties. The site is located within the administrative boundary of Reading Borough Council (RBC). Whilst the proposed development site is not within the Reading AQMA, the A4074 (along with adjacent residential properties) is within the AQMA.

This assessment has been completed in order to determine the air quality impact on existing receptors and also whether the proposed development achieves compliance against the National Air Quality Objectives (NAQOs), along with National and Local Planning Policy. This assessment has been undertaken in accordance with the Department for Environment, Food and Rural Affairs' (Defra) current Technical Guidance on Local Air Quality Management (LAQM.TG16.)¹ and covers the temporary effects on local air quality during construction, as well as the effects of local air quality on the development itself.

The report assesses the overall levels of nitrogen dioxide (NO₂) and particulates (PM₁₀ and PM_{2.5}) at the proposed development site. A glossary of terms is detailed in **Appendix 1** and the location of the site is displayed in **Section 3.1**. It is estimated that the school would be completed and occupied by September 2018, with gradual phasing until the school reached full capacity in 2023.

The potential constraints on development have been assessed on the basis of the findings of detailed dispersion modelling using BREEZE ROADS GIS Pro Version 5.1.10, which has been undertaken in the context of relevant NAQOs, Emission Limit values and relevant guidance.

¹ Local Air Quality Management Technical Guidance 2016. Defra

2. AIR POLLUTION POLICY CONTEXT

2.1. Introduction

In the UK at the present time, emissions from road transport account for a substantial proportion of national air pollutant emissions. Road transport currently contributes almost 22% of national carbon dioxide emissions². Whilst the UK is set to meet its international commitments on carbon dioxide emission reductions, the transport sector carbon dioxide emissions are continuing to grow.

The number of licensed vehicles in Great Britain in 2016 was 37.1 million, an increase of 41% from 1994³, with 83.1% of these being cars. Between 1994 and 2014, there was a substantial increase in the amount of diesel cars on the road from 7.4% to 36.2%. Of the 2,274,550 new car registrations in 2015, 51.3% of the vehicles were diesel, 45.7% were petrol with 3% used alternative fuels⁴.

It is evident that continued growth in private car ownership and usage will continue to result in a further deterioration of air quality in urban areas and increasing emissions of greenhouse gases. Whilst current technological improvements extended the reduction in emissions to approximately 2010, additional measures are now required in order to prevent re-growth of emissions, both to meet ambient air quality targets in urban areas and to offer an alternative to the car for urban journeys. Consequently, where new development can be located in relatively close proximity to public transport and local services, a contribution to the UK's target of reducing emissions will have been made.

2.2. Legislation

In 1997, the United Kingdom National Air Quality Strategy (NAQS)⁵ was published and this document, set out an analysis of the magnitude and potential health and environmental problems associated with air pollutant emissions, particularly those emanating from road traffic.

The strategy proposed a schedule of air quality objectives, which were to be met for various pollutants in the years up to 2005. In setting these objectives, due account was taken of health and socio-economic cost-benefit factors, together with consideration of the practical and pragmatic aspects of whether targets would be achievable. Whilst it was identified in the Strategy that the objectives for benzene, butadiene, lead and carbon monoxide could be achieved as a result of improvement measures already put in place, complying with targets for NO₂ and PM₁₀ would be more difficult. In considering what additional measures would have to be introduced to counter these apparent shortfalls, the Government voiced the following thought: *"changes in planning and transport policies (are needed) which would reduce the need to travel and reliance on the car"*. With regard to the necessity for encouraging a shift away from private car usage, the Strategy commented, in terms of the new package approach to transport funding, *"As a general rule, traffic demand management and restraint measures should be included and this, together with proposals to promote and enhance other modes of transport, should aim to achieve modal shifts away from the private car"*.

The White Paper on Integrated Transport (July 1998) proposed a range of measures at both national and local level to address issues of congestion and environmental effects. During the consultation

² Environmental Protection UK. (2010). Car Pollution. Available from www.environmental-protection.org.uk

³ Department for Transport. (2016). Provisional Road Traffic Estimates, Great Britain: October 2015 - September 2016 Summary

⁴ Society of Motor Manufacturers and Traders (2016). Car Registrations October 2016 Overview. Available from www.smmmt.co.uk

⁵ Defra. The National Air Quality Strategy 1997 (1997).

process in 1997, the environmental issue most frequently cited by responses was air quality and it is therefore clear that this problem is uppermost in the mind of the public. The implementation of measures to relieve congestion in urban areas, by means of improvements in provision of public transport and encouragement of a modal shift, will also benefit urban air quality.

A review of the UK Air Quality Strategy was undertaken in 1998 and a consultation document was published in January 1999, outlining proposals for amending the Strategy. In August 1999, in response to the consultation, the Government then published an Air Quality Strategy for England, Scotland, Wales and Northern Ireland. The Air Quality Regulations (England) 2000 enacted in April 2000, and the Air Quality (England) (Amendment) Regulations 2002 gave legal force to the air quality standards set out in the Strategy. A new strategy was released in July 2007 with various amendments to the air quality objectives. The proposals, in brief, consisted of recommendations to adopt the provisions of the EU Air Quality Daughter Directives.

Schedule 2 of the Air Quality Standards Regulations 2010⁶ implements a limit value for PM_{2.5} to be achieved by 2015, although they are yet to come into force and only apply to England. The Air Quality Standards (AQS) included in the Air Quality Standards Regulations 2010 are set out in **Appendix 4**.

The 'standards' are set as concentrations below which health effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a particular pollutant.

The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards. The objectives are prescribed within The Air Quality (England) Regulations 2000 (Stationery Office, 2000) and The Air Quality (England) (Amendment) Regulations 2002 (Stationery Office, 2002) (termed the 'Regulations'). Air Quality Objectives included in the Regulations and current legislation (CAFE Directive) which are relevant to the current study (NO₂ and PM₁₀) are outlined in **Appendix 4**.

The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include building façades of residential properties⁷, schools, hospitals and care homes. The 24-hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties. The 1-hour mean objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1-hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.

Measurements across the UK have shown that the 1-hour mean NO₂ objective is unlikely to be exceeded unless the annual mean NO₂ concentration is greater than 60µg/m³⁸. Thus exceedances of 60µg/m³ as an annual mean NO₂ concentration are used as an indicator of potential exceedances of the 1-hour mean NO₂ objective.

⁶ HMSO, (2010). The Air Quality Standards Regulations 2010. Statutory Instrument 1001.

⁷ Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

⁸ Defra, 2007. Analysis of the Relationship Between 1-Hour and Annual Mean Nitrogen Dioxide at UK Roadside and Kerbside Monitoring Sites, 2003. Laxen and Mariner.

Similarly, studies have also established a relationship between the annual mean PM₁₀ concentration and number of exceedances of the 24-hour mean objective: those areas where the annual mean concentrations are greater than 32µg/m³ were demonstrated to be at risk of exceeding the 24-hour mean objective. Thus exceedances of 32µg/m³ as an annual mean PM₁₀ concentration are used as an indicator of potential exceedances of the 24-hour mean PM₁₀ objective.

2.3. Planning Policy

2.3.1. National Planning Policy Framework

The new National Planning Policy Framework released in March 2012, and replaced the Planning Policy Guidance which previously covered planning and pollution control and new development in England. The purpose of the planning system is to contribute to the achievement of sustainable development. There are three dimensions to sustainable development: economic, social and environmental. The environmental role is to contribute to protecting and enhancing our natural, built and historic environment; and as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate to adapt to climate change including moving to a low carbon economy.

One of the core planning principles is to contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser value, where consistent with other policies in the Framework. The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.

In relation to air quality planning policies, they should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan. In addition, when determining planning applications, local planning authorities should ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source.

2.3.2. National Planning Practice Guidance

Whether or not air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to generate air quality impact in an area where air quality is known to be poor. They could also arise where the development is likely to adversely impact upon the implementation of air quality strategies and action plans and/or, in particular, lead to a breach of EU legislation (including that applicable to wildlife).

When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly

changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads.

- Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.
- Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.

Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.

Examples of mitigation include:

- The design and layout of development to increase separation distances from sources of air pollution;
- Using green infrastructure, in particular trees, to absorb dust and other pollutants;
- Means of ventilation;
- Promoting infrastructure to promote modes of transport with low impact on air quality;
- Controlling dust and emissions from construction, operation and demolition; and
- Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.

2.3.3. Reading Borough Council Planning Policies

RBC has two documents that provide relevant policies relating to air quality within the planning process. These are the Reading Borough Local Development Framework *Core Strategy*⁹ and *Sites and Detailed Policies*¹⁰ documents.

RBC Core Strategy - Policy CS43: Pollution and Water Resources:

- “Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution”; and
- “The Environmental Protection background paper has highlighted that there are pockets of poor air quality within Reading caused by vehicles emissions, and that some ground and surface waters are experiencing a degree of pollution. It is therefore important to ensure that future development does not result in any further deterioration of air and water quality and where possible, results in an improvement in overall quality”.

⁹ Reading Borough Council (2018) Reading Borough Local Development Framework Core Strategy

¹⁰ Reading Borough Council (2012) Reading Borough Local Development Framework Sites and Detailed Policies

RBC Sites and Detailed Policies – Policy DM19: Air Quality

Policy DM19 states the following:

“Development should have regard to the need to improve air quality and reduce the effects of poor air quality”.

- Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:
 - Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would significantly reduce air quality;
 - Whether the development is within, or accessed via, an Air Quality Management Area; and
 - Whether it can be demonstrated that a local reduction in air quality would be offset by an overall improvement in air quality, for instance through reduction in the need to travel.
- Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application; and
- Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring.

3. SITE DESCRIPTION AND BASELINE CONDITIONS

3.1. Site Description

The site is located on the existing Mapledurham Playing Fields and Pavilion Site to the south of the A4074 (Upper Woodcote Road). The site is bounded by existing residential properties and the location of the site is detailed below.

Figure 3.1: Location of the Proposed Development Site



3.2. Air Quality Review and Assessment

As previously indicated, Local Authorities have been required to carry out a review of local air quality within their boundaries to assess areas that may fail to achieve the limit values. Where these objectives are unlikely to be achieved, local authorities must designate these areas as AQMA's and prepare a written action plan to achieve the AQS's.

The review of air quality takes on several prescribed stages, of which each stage is reported. RBC's 2016 Annual Progress Report states that there is one air quality management area (AQMA) declared for NO₂ and PM₁₀. The report states that there are exceedances of the NO₂ or PM₁₀ at sites with relevant exposure. Details of the monitoring data used for model verification purposes are provided in **Section 3.3**.

3.3. Local Air Quality Monitoring

To the south-east of the development there are multiple monitoring locations. Of these, there are three suitable diffusion tubes local to the proposed development. These monitoring locations are tubes located at 197 Caversham Road, 60 Prospect Street and 14 Church Road (Caversham). These monitoring locations are 1.9km, 1.9km and 1.6km south-east respectively.

The Caversham Road automatic monitor was not deemed suitable for model verification as the monitor is located near a pedestrian crossing on a road which is much busier than those near the proposed development. Excluding the automatic monitor in favour of another diffusion tube will allow for a more representative NO_x verification factor as concentrations either further back from the road or on quieter roads will be modelled. Therefore, the verification process will be more representative of the area surrounding the proposed development.

The 2015 annual mean NO₂ concentrations for the monitoring sites are shown in **Table 3.1** below. The annual mean NO₂ NAQO is not exceeded at the monitoring location.

Table 3.1: Local Monitoring Data Suitable for Model Verification

Location	Distance to nearest Kerb (m)	Grid Reference		2015 Annual Mean NO ₂ (µg/m ³)	2015 Data Capture (%)
		X	Y		
197 Caversham Road	7.0	471161	174379	39	N/A
60 Prospect Street	3.0	471557	174994	38	N/A
14 Church Road (Caversham)	2.5	471103	174774	35	N/A

3.4. Identification of Relevant Receptors

To assess the potential impact of the proposed development, existing receptors have been selected at residential facades on roads that are likely to experience an increase in traffic. To assess the air quality constraints on the development, sensitive receptor locations were identified at key locations on the site and façades of the proposed development. **Appendix 3** identifies the Existing Receptor (ER) and Development Receptor (DR) locations.

3.5. Background Concentration of Air Pollutants

Background concentrations of air pollutants for the modelling were obtained from the 2015 pollutant concentration maps which were updated by Defra in July 2016. These updated maps are based on monitoring and meteorological data for 2013. For the sensitivity test scenarios (as outlined in **Section 4.4**), Air Quality Consultant's CURED methodology¹¹ has been followed to adjust background pollutant concentrations. **Table 3.2** identifies that the estimated background concentrations for annual mean NO₂ and PM₁₀ used in the assessment are below the annual mean objective limit of 40µg/m³.

Table 3.2: Background Concentrations of Pollutants

Location and Year	NO _x µg/m ³	NO ₂ µg/m ³	PM ₁₀ µg/m ³	PM _{2.5} µg/m ³
2015 - Verification (471500, 174500)	41.2	25.8	17.6	13.0

¹¹ Air Quality Consultants (2016) *Deriving Background Concentrations of NO_x and NO₂ for Use with 'CURED V2A'*

Location and Year	NO _x µg/m ³	NO ₂ µg/m ³	PM ₁₀ µg/m ³	PM _{2.5} µg/m ³
2015 – Site (469500, 175500)	24.9	17.1	15.8	11.3
2018 – Site (469500, 175500)	22.4	15.6	15.3	11.0
2018 – Site (CURED Adjusted) (469500, 175500)	22.8	15.8	N/A	N/A
2023 – Site (469500, 175500)	19.9	14.0	14.9	10.6
2023 – Site (CURED Adjusted) (469500, 175500)	20.9	14.7	N/A	N/A

Note: The ratio between PM₁₀ and PM_{2.5} on site is 0.72 in 2015 whilst it is 0.71 in 2019 and 2023.

4. METHODOLOGY AND ASSESSMENT CRITERIA

4.1. Methodology

In the UK, Defra provides guidance on the most appropriate methods to estimate pollutant concentrations for use in Local Air Quality Management (LAQM). Defra regularly updates its Technical Guidance, with the latest LAQM Technical Guidance (TG16) published in April 2016. The methodology in LAQM.TG16. directs air quality professionals to a number of tools published by Defra to predict and manage air quality. For example, it is necessary to use the updated NO_x to NO₂ calculator to derive NO₂ concentrations from the NO_x outputs from BREEZE ROADS modelling. This is because NO₂ concentrations within the model are predicted using the CALINE4 NO_x to NO₂ conversion methodology, which should not be used within the model as current evidence shows that the proportion of primary NO₂ in vehicle exhausts has increased since the model was developed, which would affect the relationship between NO_x and NO₂ at roadside locations.

In order to determine the extent to which air quality issues will affect the development of the site, the study has considered the following:

- Any air quality measurements carried out in the area near the proposed development; and
- The most recent Air Quality Review and Assessment Reports from Reading Borough Council.

4.2. BREEZE ROADS Modelling of Pollutant Concentrations

Dispersion modelling has been undertaken using BREEZE ROADS to determine air quality concentrations across the site. BREEZE ROADS is an air dispersion modelling software suite that predicts air quality impacts of carbon monoxide (CO), nitrogen dioxide, particulate matter (PM), and other inert pollutant concentrations from moving and idling motor vehicles at or alongside roadways and roadway intersections.

BREEZE ROADS can be used in conjunction with the MOBILE5, EMFAC emission models or other emissions data, to demonstrate compliance with the UK's National Air Quality Strategy. BREEZE ROADS predicts air pollutant concentrations near highways and arterial streets due to emissions from motor vehicles operating under free-flow conditions and idling vehicles. In addition, 1-hour and running 8-hour averages of CO or 24-hour and annual block averages of PM₁₀ can be calculated.

4.3. Model Set-up Parameters

The most recent Emissions Factor Toolkit (EFT, version 7.0, July 2016) was used to derive emissions factors (in grams per kilometre) for vehicle movement along roads incorporated into the model. This version includes updates to COPERT NO_x emissions factors for some light duty vehicles, and particulate matter and hydrocarbons are now based on COPERT emissions factors. There have also been updates to the vehicle fleet and age information. Version 7.0 was produced by Defra in response to changes in 'real world' vehicle emissions. As such, it has been assumed that the EFT produces reliable emission factors which are suitable for dispersion modelling as it is the most up-to-date tool provided by Defra. Meteorological data from nearby Farnborough Airport has been used in the models.

4.4. Sensitivity Test

To assess future modelling uncertainty, a sensitivity test for NO₂ has been used to create a scenario where background pollutants and vehicle emissions may not improve as significantly as the Defra emission factors toolkit and background mapping suggest. The methodology for the NO₂ sensitivity test which has been utilised is the Air Quality Consultants 'Calculator Using Realistic Emissions for Diesels' (CURED V2A) with the methodology outlined in 'Deriving Background Concentrations of NO_x and NO₂ for Use with 'CURED V2A''¹².

4.5. Local Air Quality Management Technical Guidance (2016) Recommendations

The Local Air Quality Management Technical Guidance (TG.16) has made recommendations of where the AQS should and should not be applied, as summarised in **Table 4.1**.

As it is not always possible to be prescriptive in this matter, Local Authorities may apply local knowledge and judgement when considering the application of the AQS. The examples given in **Table 4.1** are not intended to be a comprehensive list.

Table 4.1: Examples of Where AQS Should Be Applied

Averaging Period	AQS Should Apply	AQS Should Not Apply
Annual Mean	All locations where members of the public might be regularly exposed. Building facades of: • Residential properties • Schools • Hospitals • Care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access. • Hotels, unless people live there as their permanent residence. • Residential gardens • Kerbside sites or any other location where public exposure is expected to be short term.
24-hour and 8-hour mean	All locations where the annual mean objective would apply. • Hotels • Residential gardens	Kerbside sites or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. • Kerbside sites (e.g. pavements of busy shopping streets) • Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might spend one hour or more. • Any outdoor locations where members of the public might spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-min mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

¹² Air Quality Consultants (2016) *Deriving Background Concentrations of NO_x and NO₂ for Use with 'CURED V2A'*

4.6. Applying the AQS to this Development

This planning application includes a school building, which according to **Table 4.1** is a location where the AQS calendar year limit value applies. The 24-hour and 1-hour mean objectives will also be considered where relevant.

4.7. Assessment Criteria

A detailed assessment was considered appropriate for this proposed development with model results being verified against local monitoring data. This was carried out using the detailed dispersion model BREEZE ROADS.

For the purposes of this assessment, the limit values assigned to individual pollutants as set out in the Air Quality Standards Regulations 2010 should form the basis of the air quality assessment. The limit values are based on an assessment of the effects of each pollutant on public health. Therefore, they are a good indicator in assessing whether, under normal circumstances, the air quality in the vicinity of a development is likely to be detrimental to human health.

4.8. Construction Phase

During the construction phase, there will be a number of activities undertaken that have the potential to generate and/or re-suspend dust and PM₁₀/PM_{2.5}. At the time of assessment the exact activities to be undertaken during construction are unknown. In order to evaluate the magnitude and extent of potential adverse impacts likely to result from the proposed development, it has been assumed that the following construction activities could be responsible for the emission of dust:

- Handling, storing, stockpiling and disposing of materials, including potential spillages;
- Ground disturbance and exhaust emissions associated with the operation of site plant;
- Laying of hard surfaces and landscaping;
- Site clearance and preparation;
- Construction and fabrication processes; and
- Internal and external finishing.

The magnitude of the potential impacts of a construction site on air quality is mainly determined by its size, the range of activities undertaken across the site, the proximity of the site to sensitive receptors, the prevailing wind direction, the complexity of terrain and any barriers between the sources and receptors. A qualitative assessment of the potential impacts during construction has been undertaken using information in guidance documents produced by the Building Research Establishment¹³, the London Councils¹⁴ (see **Section 2.3.4**) and the recent document produced by the Institute of Air Quality Management¹⁵.

¹³ BRE, 2003. Control of Dust from Construction and Demolition Activities

¹⁴ London Councils, 2014. The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, 2014

¹⁵ IAQM, 2016. Guidance on the Assessment of Dust from Demolition and Construction.

Following the release of the IAQM Guidance in 2016, the assessment criteria have been revised. The dust assessment criteria have now been broken down into five steps;

- Step 1: Screen the need for a detailed assessment;
- Step 2: Assess the risk of dust impacts;
 - Step 2A – Determine the scale and nature of the works;
 - Step 2B – Assess the sensitivity of the area;
 - Step 2C – Combine 2A and 2B to determine the risk of dust impacts;
- Step 3: Site Specific Mitigation;
- Step 4: Determine Significance of Effects;
- Step 5: Dust Assessment Report.

According to the IAQM Guidance (2016), activities on construction sites can be divided into four types to reflect their different potential impacts, with the potential for dust emissions to be assessed only for each activity taking place:

- Demolition;
- Earthworks;
- Construction; and
- Trackout.

The assessment methodology is to consider three separate dust effects:

- Annoyance due to soiling;
- Harm to ecological receptors; and
- The risk of health effects due to a significant increase in exposure to PM₁₀

Account is also to be taken of the distance of the receptors that may experience these effects. Receptors are generally considered to be of a medium or high sensitivity to each type of construction activity when they are situated within 200m of the site boundary. Human receptors include locations where people spend time and where property may be affected by dust. In terms of annoyance effects, this will most commonly relate to the loss of amenity due to dust deposition or visible dust plumes, often related to people making complaints, but not necessarily sufficient to be a statutory nuisance. Details of the assessment of construction dust can be found in **Appendix 6**.

The wind rose provided in **Appendix 5**, identifies that the predominant wind direction in the region is from the south-west. As such, it is expected that receptors located to the north-east are more at risk of experiencing the effects of construction dust.

The assessment procedure assumes no mitigation measures are applied except those required by legislation. **Tables 4.2 to 4.5** set out the risk category from each of the four types of activity.

Table 4.2: Risk Category from Demolition Activities

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site	Medium Risk Site	Medium Risk Site
Medium	High Risk Site	Medium Risk Site	Low Risk Site
Low	Medium Risk Site	Low Risk Site	Negligible

Table 4.3: Risk Category from Earthworks Activities

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site	Medium Risk Site	Low Risk Site
Medium	Medium Risk Site	Medium Risk Site	Low Risk Site
Low	Low Risk Site	Low Risk Site	Negligible

Table 4.4: Risk Category from Construction Activities

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site	Medium Risk Site	Low Risk Site
Medium	Medium Risk Site	Medium Risk Site	Low Risk Site
Low	Low Risk Site	Low Risk Site	Negligible

Table 4.5: Risk Category from Trackout

Sensitivity of the Area	Dust Emission Class		
	Large	Medium	Small
High	High Risk Site	Medium Risk Site	Low Risk Site
Medium	Medium Risk Site	Low Risk Site	Negligible
Low	Low Risk Site	Low Risk Site	Negligible

4.9. Operation Phase

The main pollutants of concern are generally considered to be NO₂ and PM₁₀ for road traffic. The BREEZE ROADS methodology has been used for this assessment to predict the constraints on development.

For the assessment, the following scenarios were considered:

- 2015 Model Verification;
- 2015 Baseline;
- 2018 Opening Year;
- 2018 Opening Year (Sensitivity Test);
- 2023 Opening Year; and
- 2023 Opening Year (Sensitivity Test);

4.10. Traffic Data

The BREEZE ROADS prediction model requires the user to provide various input data, including the Annual Average Hourly Traffic (AAHT) flow, emission factor, the distance of the road centreline from the receptors and vehicle speeds.

The traffic information is detailed in **Table 4.6** and **Table 4.7** below for both the verification and assessment scenarios. Traffic flow, vehicle split were obtained from DfT count points. Vehicle speeds near junctions and crossings were reduced to replicate queuing traffic and potentially increased emissions.

Table 4.6: 2015 Traffic Flow Data for Verification and Baseline

Location	AAHT	Speed (km/h)	HGV (%)
A4155 Caversham Road	1168	48	3.5
A329 Caversham Road	1456	48	4.4
Church Street	399	48	2.0
A4074 Woodcote Road/St Peter's Hill	453	48	3.2

Table 4.7 identifies the 2018 AAHT flows for roads surrounding the proposed development with the proposed development in place. A traffic growth factor (specific to Reading Borough Council) of 1.0497 was attained using TEMPro Version 7 and applied to the relevant 2015 baseline flows.

The transport assessment by MLM Consulting Engineers concludes that in 2018 (based on current site transport surveys) 20.4% of pupils will travel by car, 3% will car share and 64.5% of all staff will travel by car. Therefore, using expected 2018 pupil roll and staff figures it has been possible to determine the additional two-way vehicle movements at peak times (between 08:00 - 09:00 and 15:00 – 16:00 Monday to Friday).

Table 4.7: 2018 Opening Year Traffic Flow Data

Location	AAHT	Speed (km/h)	HGV (%)
A4074 Woodcote Road	476	48	3.2
A4074 Woodcote Road (with Additional Peak Hour School Traffic)	660	48	3.2
School Access Road (Peak Hours Only)	27	15	0.0

Table 4.8 identifies the 2023 AAHT flows which relate to the year in which the school is expected to be fully occupied. The traffic growth factor between 2015 and 2023 has been identified as 1.1342. As outlined above, the peak time traffic has been identified using the percentages provided in the transport assessment.

Table 4.8: 2023 Traffic Flow Data

Location	AAHT	Speed (km/h)	HGV (%)
A4074 Woodcote Road/St Peter's Hill	514	48	3.2
A4074 Woodcote Road (with Additional Peak Hour School Traffic)	758	48	3.2
School Access Road (Peak Hours Only)	30	15	0.0

4.11. Validation and Verification of the Model

Model validation undertaken by the software developer will not have been carried out in the vicinity of the site being considered in this assessment. As a result, it is necessary to perform a comparison of the modelled results with local monitoring data at suitable locations. This verification process aims to minimise model uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results. The verification was carried out in accordance with LAQM.TG16. Suitable monitoring data for the purpose of verification is available for concentrations of NO₂ and PM₁₀ at the monitoring positions detailed in **Section 3.2**.

The verification exercise resulted in an average difference for the NO_x contribution between the modelled and monitored NO_x roads of -73.9%, which indicates that the model is significantly under predicting. When the monitored and modelled results are compared as recommended in LAQM.TG16 the road NO_x adjustment factor is **3.9380** (as identified in **Table 4.9**). This factor was applied to all modelled NO_x results prior to calculating modelled NO₂ using the NO_x to NO₂ calculator. In the absence of appropriate PM₁₀ monitoring within close proximity to the site, the NO_x adjustment factor has also been applied to the PM₁₀ modelled concentrations, in accordance with the guidance provided in LAQM.TG16.

Table 4.9: NO₂ Annual Mean Verification for 2015

Monitoring Position	Monitored		Modelled		% Difference (NO ₂ Total) Before Adjustment	% Difference (NO ₂ Total) After Adjustment	Road NO _x Factor
	Road NO ₂ µg/m ³	Road NO _x ¹⁶ µg/m ³	Road NO ₂ µg/m ³	Road NO _x µg/m ³			
197 Caversham Road (Diffusion Tube)	13.5	29.3	4.4	9.0	-23.3	6.7	3.9380
60 Propsect Street	11.8	25.4	2.6	5.2	25.3	-6.5	
14 Church Road Caversham (Diffusion Tube)	9.6	20.3	2.7	5.5	19.5	1.7	

Table 4.10 summarises the statistics that are typically used to assess uncertainty in the verification model (as suggested in LAQM.TG16).

Typically, with smaller datasets the root mean square error (RMSE) is the important statistic and the verification process resulted in an RMSE value well below the target value. Therefore, there is a high level of confidence in the verification process.

¹⁶ Obtained from NO_x to NO₂ Calculator Spreadsheet available from www.laqm.FDefra.gov.uk

Table 4.10: A Summary of the Statistics Used to Assess Model Uncertainty

Statistical Parameter	Value	Description
Correlation Coefficient	0.72	Used to measure the linear relationship between predicted and observed data. The ideal value (an absolute relationship) is 1.
Root Mean Square Error (RMSE)	2.1	RMSE defines the average error/uncertainty of the model verification and is in the same units as the model outputs ($\mu\text{g}/\text{m}^3$). Values should be $<10 \mu\text{g}/\text{m}^3$ or ideally $<4 \mu\text{g}/\text{m}^3$ where concentrations are near the AQO. The ideal value is $0 \mu\text{g}/\text{m}^3$.
Fractional Bias	0	Identifies if the model shows a systematic tendency to over/under predict concentrations. The ideal value is 0 and range between ± 2 . Negative values suggest an over prediction whilst positive values suggest under prediction.

4.12. Assessment of PM_{2.5}

The 2007 Air Quality Strategy introduced a new exposure reduction regime for PM_{2.5}, tiny particles associated with respiratory and cardio-vascular illness and mortality which have no known safe limit for human exposure. The new regime will attempt to reduce the exposure of all urban dwellers, alongside the existing method of reducing hotspots of PM exposure. PM_{2.5} typically makes up two thirds of PM₁₀ emissions and concentrations. However, objectives for PM_{2.5} (as shown in **Table 4.11**) are not currently incorporated into Local Air Quality Management regulations, therefore there is no statutory obligation to review and assess air quality against them.

Table 4.11: National Exposure Reduction Target, Target Value and Limit Value for PM_{2.5}

Time Period	Objective/Obligation	To be achieved by
Annual mean	Target value of $25\mu\text{g}/\text{m}^3$	2010
Annual mean	Limit value of $25\mu\text{g}/\text{m}^3$	2015
Annual mean	Stage 2 indicative limit value of $20\mu\text{g}/\text{m}^3$	2020
3 year Average Exposure Indicator (AEI) ^a	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
3 year Average Exposure Indicator (AEI) ^a	Exposure concentration obligation of $20\mu\text{g}/\text{m}^3$ (of vegetation)	2015

^a The 3 year running mean of AEI is calculated from the PM_{2.5} concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.

Presently, BREEZE ROADS does not predict the concentration of PM_{2.5} as part of the methodology therefore the future concentration of PM_{2.5} will be calculated using the typical ratio between the background concentrations of PM₁₀ and PM_{2.5} for the opening year of development. This predicted concentration will then be compared against the annual mean Objective Limit value of $25\mu\text{g}/\text{m}^3$.

5. IMPACTS ON AIR QUALITY

5.1. Predicted Construction Impacts

The main sources of dust and particulate matter during the construction phase include:

- Handling, storing, stockpiling and disposing of materials, including potential spillages;
- Ground disturbance and exhaust emissions associated with the operation of site plant;
- Laying of hard surfaces and landscaping;
- Site clearance and preparation;
- Construction and fabrication processes;
- Internal and external finishing; and
- Emissions associated with construction traffic on haulage routes and nearby roads.

The majority of the releases are likely to occur during the typical 'working-week'. However, for some potential sources, for example exposed soil produced from earthworks activities, in the absence of dust control mitigation measures, dust generation has the potential to occur 24-hours per day, over the period during which such activities take place.

Depending on wind speed and turbulence it is likely that the majority of dust will be deposited in the area immediately surrounding the source (up to 200 metres away). The wind rose in **Appendix 5** identifies that the dominant wind direction for the site is from the south-west. Therefore, properties within 200m to the north-east of the site are more at risk of experiencing the effects of construction dust. The risk of effects are summarised in **Table 5.1** below and the assessment was carried out qualitatively using professional judgement. It should be noted that there will be no demolition on site as it is currently a grass playing field with no buildings in the area of the proposed development.

Table 5.1: Summary of Risk Effects with No Mitigation

Source	Dust Soiling Effects	Ecological Effects	PM ₁₀ Effects
Demolition	N/A	N/A	N/A
Earthworks	Medium Risk	Negligible	Low Risk
Construction	Medium Risk	Negligible	Low Risk
Trackout	Negligible	Negligible	Negligible

In consideration of the factors described above, the overall effects of dust nuisance without mitigation would therefore be temporary, short term, local in effect and of low to medium risk.

5.2. Air Quality Impact of Traffic - Acceptability Criteria

It is common in the UK to use the Environmental Protection UK's (EPUK) Guidance¹⁷ on Air Quality Assessments for Planning Applications to assess the impact of a development. This advises that an air quality assessment will be required where the development is anticipated to give rise to significant

¹⁷ Environmental Protection UK (2010 Update) – Development Control: Planning for Air Quality

changes in air quality. There will also be a need to assess air quality implications of a development where a significant change in relevant exposure is anticipated. A full air quality assessment should normally be undertaken where proposals give a rise to significant changes in either volumes, typically a change in annual average daily traffic (AADT) or peak traffic flows of +/-5% or +/-10%, depending on local circumstances, or in vehicle speed (or both), usually on a road with more than 10,000 AADT (5,000 if narrow and congested). It also advises of the need for an assessment where the proposals will:

- Generate or increase congestion;
- Alter the traffic composition on local roads;
- Include significant new car parking;
- Significantly affect nitrogen deposition on sensitive habitats;
- Introduce new exposure close to existing sources of air pollutants;
- Include biomass boilers or biomass-fuelled CHP plant;
- Include centralised boilers of CHP;
- Give rise to potentially significant impacts during construction; or
- Include a large, long-term construction site.

5.3. Air Quality Impact of Traffic - Assessment

The proposed development traffic generation has been provided in the proposed development transport assessment which outlines the expected traffic generation of the development between 2018 and 2023. It is estimated in 2018 that the development will increase the AADT on the A4074 by 1.6% whilst in 2023 the development will give rise to a 2.0% increase.

5.4. Air Quality Impacts

In May 2015, Environmental Protection UK (EPUK) and the Institution of Air Quality Management (IAQM) updated their guidance on "Land-Use Planning and Development Control: Planning for Air Quality"¹⁸. The guidance provides a methodology for determining the impacts of increased pollutant concentrations at sensitive receptor locations resulting from emission sources. The AQAL is the Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level'

Table 5.2: Air Quality Impact Criteria

Long Term Average Concentration in Assessment Year	% Change in Concentration relative the Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less 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

¹⁸ EPUK and IAQM, 2015. Land-Use Planning and Development Control: Planning for Air Quality

Long Term Average Concentration in Assessment Year	% Change in Concentration relative the Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

5.5. Predicted Constraints on Development

In order to characterise the air quality at the proposed development, predictions of air pollutant concentrations have been carried out for an initial occupation year of 2018, with a fully occupied year of 2023 using the BREEZE ROADS dispersion model and UK emission factors. The results of the predictions which include the road NO_x adjustment factor (**Table 4.9**) can be seen in **Tables 5.3** to **5.14**.

5.6. 2015 Baseline Pollutant Concentrations

5.6.1. 2015 Baseline Annual Mean NO₂ Concentrations - Existing Receptors

NO₂ concentrations were modelled for the year 2015 at each of the selected existing receptors and are outlined in **Table 5.3**. At all of the locations, concentrations were significantly below the annual mean objective. The highest predicted concentration was 21.8µg/m³ at ER5, which is located at the northern side of the A4075 to the north-east of the proposed site entrance.

Table 5.3: Modelled Baseline (2015) NO₂ Concentrations

Receptor	Sensitive?	Air Quality Objective (µg/m ³)	NO ₂ Road Contribution (µg/m ³)	Total NO ₂ (µg/m ³)
ER1	Yes	40	0.9	18.0
ER2			1.9	18.9
ER3			4.0	21.1
ER4			4.0	21.1
ER5			4.8	21.8

5.6.2. 2015 Baseline Annual Mean Particulate Concentrations - Existing Receptors

Predicted 2015 baseline annual PM₁₀ concentrations range from 15.9µg/m³ (ER1) to 16.5µg/m³ (ER5) at existing sensitive receptors. The pollutant concentrations in **Table 5.4** have been compared to the annual mean limit value for PM₁₀ and it is apparent that the existing receptor concentrations are significantly below the Objective Level. In addition, the number of days exceeding the 50µg/m³ limit is below the 35 days Objective identified in the NAQO at all of the modelled receptor locations.

Predicted 2015 baseline annual PM_{2.5} concentrations range from 11.3µg/m³ (ER1) to 11.7µg/m³ (ER5) at existing sensitive receptors. The pollutant concentrations in **Table 5.4** have been compared to the annual mean limit value for PM_{2.5} and it is apparent that the existing receptor concentrations are significantly below the Objective Level.

Table 5.4: Modelled Baseline (2015) PM₁₀ Concentrations

Receptor	Sensitive?	PM ₁₀ Air Quality Objective (µg/m ³)	Total PM ₁₀ µg/m ³ (Days >50 µg/m ³) ¹⁹	PM _{2.5} Air Quality Objective (µg/m ³)	Total PM _{2.5} µg/m ³
ER1	Yes	40	15.9 (0)	25	11.3
ER2			16.1 (0)		11.4
ER3			16.4 (0)		11.6
ER4			16.4 (0)		11.6
ER5			16.5 (0)		11.7

5.7. 2018 Pollutant Concentrations

5.7.1. 2018 Baseline Annual Mean NO₂ Concentrations

Table 5.5 outlines the modelled baseline NO₂ concentrations in 2018. The highest modelled concentration is 19.1µg/m³ (ER5), whilst the lowest modelled concentration was 16.1µg/m³ (ER1). In addition, it is not anticipated that there will be any exceedance of the 1-hour objective (200µg/m³) at existing receptors in 2018.

As such, there are not expected to be any exceedances of the annual mean objective for NO₂ at any existing receptor location in 2018.

Table 5.5: Modelled 2018 Baseline NO₂ Concentrations

Receptor	Air Quality Objective (µg/m ³)	NO ₂ Road Contribution (µg/m ³)	Total NO ₂ (µg/m ³)	Maximum Modelled 1-hour Concentration (µg/m ³)
ER1	40	0.7	16.3	25.0
ER2		1.4	17.0	30.4
ER3		3.1	18.6	32.1
ER4		3.0	18.6	31.1
ER5		3.6	19.1	33.1

5.7.2. 2018 Annual Mean NO₂ Concentrations – With Proposed Development

In order to quantify the impact of the proposed development and to assess the predicted air quality both existing and development receptors have been modelled. This scenario uses 2018 traffic flows with the addition of the peak hour traffic generation from the proposed development. In 2018 it is estimated that there will be 278 pupils and 41 staff.

The highest annual mean NO₂ concentration at existing sensitive receptors was 19.2µg/m³ (ER5) which is significantly below the annual mean objective of 40µg/m³. The impact of development on the existing receptors has been assessed using the EPUK/IAQM assessment matrix (**Table 5.2**). Using the 2018 baseline assessment as presented in **Table 5.5**, it is apparent that all existing receptors are

¹⁹ Not to be exceeded more than 35 times a year

below the 75% AQAL threshold. The development does not result in a concentration increase (relative to the AQAL) of greater than 5% (as outlined in **Table 5.6**) therefore the air quality impact of the proposed development is 'negligible'.

As outlined in **Appendix 2**, different receptor locations have been chosen to assess the air quality around the proposed development. It is not anticipated that any receptor location on the proposed development would exceed the annual mean objective for NO₂. The highest NO₂ concentration predicted at a proposed sensitive receptor is 16.0µg/m³ (DR1 – reception play area), which is located on the north of the school site. In addition, the maximum 1-hour NO₂ concentration has also been modelled to assess pupil's exposure whilst outside. The maximum 1-hour NO₂ concentration was 22.9µg/m³ (DR1).

Accordingly, it is considered that NO₂ in 2018 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future users of the site from exceedances of NO₂.

Table 5.6: Modelled 2018 NO₂ Concentrations with Development

Receptor	Air Quality Objective (µg/m ³)	NO ₂ Road Contribution (µg/m ³)	Total NO ₂ (µg/m ³)	Maximum Modelled 1-hour Concentration (µg/m ³)	Percentage Change (from 2018 Baseline) Relative to AQAL	Air Quality Impact
DR1	40	0.4	16.0	22.9	N/A	N/A
DR2		0.4	15.9	22.0	N/A	N/A
DR3		0.3	15.8	21.1	N/A	N/A
DR4		0.3	15.9	21.4	N/A	N/A
ER1		0.7	16.3	25.0	<0.1	Negligible
ER2		1.5	17.0	31.1	0.2	Negligible
ER3		3.1	18.6	32.5	0.2	Negligible
ER4		3.1	18.6	31.3	0.2	Negligible
ER5		3.6	19.2	36.6	0.2	Negligible

5.7.3. 2018 Annual Mean NO₂ Concentrations – Sensitivity Test

Table 5.7 outlines the modelled concentrations using the adjusted emissions factors and background concentrations. The sensitivity test resulted in no significant increase in annual mean NO₂ concentrations with a highest annual mean concentration at the existing sensitive receptors of 20.5µg/m³ (ER5). In addition, there was an increase in the highest 1-hour NO₂ concentration at all existing receptors, with the largest increase of 5.7µg/m³ (ER5). However, this is significantly under the 200µg/m³ 1-hour limit value.

As in **Table 5.6**, the impact of the development on existing receptors is negligible and there are no exceedances of the annual mean objective for NO₂.

Table 5.7: Modelled 2018 NO₂ Concentrations with Development (Sensitivity Test)

Receptor	Total NO ₂ Without development – Sensitivity Test (µg/m ³)	Maximum Modelled 1-hour Concentration Without Development (µg/m ³)	Total NO ₂ With development – Sensitivity Test (µg/m ³)	Maximum Modelled 1-hour Concentration with Development (µg/m ³)	Percentage Change Relative to AQAL	Air Quality Impact
DR1	N/A	N/A	16.4	25.3	N/A	N/A
DR2	N/A	N/A	16.3	24.2	N/A	N/A
DR3	N/A	N/A	16.2	23.1	N/A	N/A
DR4	N/A	N/A	16.3	23.4	N/A	N/A
ER1	16.7	27.4	16.8	28.0	0.1	Negligible
ER2	17.6	33.9	17.7	35.6	0.2	Negligible
ER3	19.7	35.8	19.8	37.4	0.3	Negligible
ER4	19.7	34.5	19.8	35.9	0.3	Negligible
ER5	20.4	36.7	20.5	42.4	0.4	Negligible

5.7.4. NO₂ 1-hour Exposure Assessment

The highest 1-hour NO₂ concentrations for both the standard assessment and sensitivity test were 36.6µg/m³ and 42.4µg/m³ respectively (both at ER5). Therefore, it is not expected that the 1-hour limit of 200µg/m³ would ever be breached.

5.7.5. 2018 Annual Mean PM₁₀ Concentrations

As with the NO₂ assessment, PM₁₀ concentrations have been quantified using the EPUK/IAQM impact assessment. The highest PM₁₀ concentration with development at an existing receptor is 16.0µg/m³ (ER5). The development is predicted to have a negligible impact with respect to PM₁₀ concentrations at all existing receptor locations.

With respect to the proposed development receptors, it is not anticipated that any receptor location on the proposed development would exceed the annual mean objective for PM₁₀. The highest PM₁₀ concentration identified at a proposed sensitive location is 15.4µg/m³ (all locations). Accordingly, it is considered that PM₁₀ in 2018 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future users of the site from exceedances of PM₁₀.

Table 5.8: Modelled 2018 PM₁₀ Concentrations

Receptor	Air Quality Objective (µg/m ³)	Total PM ₁₀ Without Development µg/m ³ (Days >50 µg/m ³) ²⁰	Total PM ₁₀ With Development µg/m ³ (Days >50 µg/m ³)	Percentage Change Relative to AQAL	Air Quality Impact
DR1	40	N/A	15.4 (0)	N/A	N/A

²⁰ Not to be exceeded more than 35 times a year

Receptor	Air Quality Objective ($\mu\text{g}/\text{m}^3$)	Total PM ₁₀ Without Development $\mu\text{g}/\text{m}^3$ (Days >50 $\mu\text{g}/\text{m}^3$) ²⁰	Total PM ₁₀ With Development $\mu\text{g}/\text{m}^3$ (Days >50 $\mu\text{g}/\text{m}^3$)	Percentage Change Relative to AQAL	Air Quality Impact
DR2	25	N/A	15.4 (0)	N/A	N/A
DR3		N/A	15.4 (0)	N/A	N/A
DR4		N/A	15.4 (0)	N/A	N/A
ER1		15.5 (0)	15.5 (0)	<0.1	Negligible
ER2		15.6 (0)	15.6 (0)	<0.1	Negligible
ER3		15.9 (0)	15.9 (0)	<0.1	Negligible
ER4		15.9 (0)	15.9 (0)	<0.1	Negligible
ER5		16.0 (0)	16.0 (0)	<0.1	Negligible

5.7.6. 2018 Annual Mean PM_{2.5} Concentrations

As with the NO₂ and PM₁₀ assessments, PM_{2.5} concentrations have been quantified using the EPUK/IAQM impact assessment. The highest PM_{2.5} concentrations with development at an existing receptor is 11.4 $\mu\text{g}/\text{m}^3$ (ER5). The development is predicted to have a negligible impact with respect to PM_{2.5} concentrations at all existing receptor locations.

With respect to the proposed development receptors, it is not anticipated that any receptor location on the proposed development would exceed the annual mean objective for PM_{2.5}. The highest PM_{2.5} concentration identified at a proposed sensitive location is 10.9 $\mu\text{g}/\text{m}^3$ (all locations). Accordingly, it is considered that PM_{2.5} in 2018 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future users of the site from exceedances of PM_{2.5}.

Table 5.9: Modelled 2018 PM_{2.5} Concentrations

Receptor	Air Quality Objective ($\mu\text{g}/\text{m}^3$)	Total PM _{2.5} Without Development ($\mu\text{g}/\text{m}^3$)	Total PM _{2.5} With Development ($\mu\text{g}/\text{m}^3$)	Percentage Change Relative to AQAL	Air Quality Impact
DR1	25	N/A	10.9	N/A	N/A
DR2		N/A	10.9	N/A	N/A
DR3		N/A	10.9	N/A	N/A
DR4		N/A	10.9	N/A	N/A
ER1		11.0	11.0	<0.1	Negligible
ER2		11.1	11.1	<0.1	Negligible
ER3		11.3	11.3	<0.1	Negligible
ER4		11.3	11.3	<0.1	Negligible
ER5		11.4	11.4	<0.1	Negligible

5.8. 2023 Pollutant Concentrations

5.8.1. 2023 Baseline Annual Mean NO₂ Concentrations

Table 5.10 outlines the modelled baseline NO₂ concentrations in 2023. The highest modelled concentration is 16.4µg/m³ (ER5), whilst the lowest modelled concentration was 14.5µg/m³ (ER1). As such, there are not expected to be any exceedances of the annual mean objective for NO₂ at any existing receptor location in 2023.

Table 5.10: Modelled 2023 Baseline NO₂ Concentrations

Receptor	Air Quality Objective (µg/m ³)	NO ₂ Road Contribution (µg/m ³)	Total NO ₂ (µg/m ³)	Maximum Modelled 1-hour Concentration (µg/m ³)
ER1	40	0.5	14.5	20.2
ER2		0.9	15.0	23.9
ER3		2.0	16.0	25.1
ER4		1.9	16.0	24.4
ER5		2.3	16.4	25.7

5.8.2. 2023 Annual Mean NO₂ Concentrations – With Proposed Development

In order to quantify the impact of the proposed development and to assess the predicted air quality both existing and development receptors have been modelled. This scenario uses 2023 traffic flows with the addition of the peak hour traffic generation from the proposed school. In 2023 it is estimated that there will be 420 pupils and 50 staff.

The highest annual mean NO₂ concentration at existing sensitive receptors was 16.4µg/m³ (ER5) which is significantly below the annual mean objective of 40µg/m³. The impact of development on the existing receptors has been assessed using the EPUK/IAQM assessment matrix (**Table 5.2**). Using the 2023 baseline assessment as presented in **Table 5.10**, it is apparent that all existing receptors are below the 75% AQAL threshold. The development does not result in a concentration increase (relative to the AQAL) of greater than 5% (as outlined in **Table 5.11**) therefore the air quality impact of the proposed development is 'negligible'.

As outlined in **Appendix 2**, different receptor locations have been chosen to assess the air quality around the proposed development. It is not anticipated that any receptor location on the proposed development would exceed the annual mean objective for NO₂. The highest NO₂ concentration predicted at a proposed sensitive receptor is 14.3µg/m³ (DR1, DR2 and DR4) which is significantly below the annual mean objective. In addition, the maximum 1-hour NO₂ concentration has also been modelled to assess pupil's exposure whilst outside. The maximum 1-hour NO₂ concentration was 18.9µg/m³ (DR1).

Accordingly, it is considered that NO₂ in 2023 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future users of the site from exceedances of NO₂.

Table 5.11: Modelled 2023 NO₂ Concentrations with Development

Receptor	Air Quality Objective (µg/m ³)	NO ₂ Road Contribution (µg/m ³)	Total NO ₂ (µg/m ³)	Maximum Modelled 1-hour Concentration (µg/m ³)	Percentage Change (from 2018 Baseline) Relative to AQAL	Air Quality Impact
DR1	40	0.3	14.3	18.9	N/A	N/A
DR2		0.2	14.3	18.3	N/A	N/A
DR3		0.2	14.2	17.7	N/A	N/A
DR4		0.2	14.3	17.9	N/A	N/A
ER1		0.5	14.5	20.2	<0.1	Negligible
ER2		1.0	15.0	25.0	0.1	Negligible
ER3		2.0	16.1	26.0	0.1	Negligible
ER4		2.0	16.0	25.1	0.2	Negligible
ER5		2.4	16.4	29.0	0.2	Negligible

5.8.3. 2023 Annual Mean NO₂ Concentrations – Sensitivity Test

Table 5.12 outlines the modelled concentrations using the adjusted emissions factors and background concentrations. The sensitivity test resulted in no significant increase in annual mean NO₂ concentrations with a highest annual mean concentration at the existing sensitive receptors of 17.9µg/m³ (ER5). In addition, there was an increase in the highest 1-hour NO₂ concentration at all existing receptors, with the largest increase of 4.8µg/m³ (ER5). However, this is significantly under the 200µg/m³ 1-hour limit value.

As in **Table 5.11**, the impact of the school on existing receptors is negligible and there are no exceedances of the annual mean objective for NO₂.

Table 5.12: Modelled 2023 NO₂ Concentrations with Development (Sensitivity Test)

Receptor	Total NO ₂ Without development – Sensitivity Test (µg/m ³)	Maximum Modelled 1-hour Concentration Without Development (µg/m ³)	Total NO ₂ With development – Sensitivity Test (µg/m ³)	Maximum Modelled 1-hour Concentration with Development (µg/m ³)	Percentage Change (from 2018 Baseline) Relative to AQAL	Air Quality Impact
DR1	N/A	N/A	15.1	22.4	N/A	N/A
DR2	N/A	N/A	15.1	21.5	N/A	N/A
DR3	N/A	N/A	15.0	20.5	N/A	N/A
DR4	N/A	N/A	15.0	20.8	N/A	N/A
ER1	15.4	24.5	15.5	24.5	0.1	Negligible
ER2	16.1	30.2	16.2	31.7	0.2	Negligible
ER3	17.8	31.9	17.9	33.3	0.2	Negligible

Receptor	Total NO ₂ Without development – Sensitivity Test (µg/m ³)	Maximum Modelled 1-hour Concentration Without Development (µg/m ³)	Total NO ₂ With development – Sensitivity Test (µg/m ³)	Maximum Modelled 1-hour Concentration with Development (µg/m ³)	Percentage Change (from 2018 Baseline) Relative to AQAL	Air Quality Impact
ER4	17.8	30.9	17.9	32.0	0.2	Negligible
ER5	18.4	32.9	18.5	37.7	0.3	Negligible

5.8.4. NO₂ 1-hour Exposure Assessment

The highest 1-hour NO₂ concentrations for both the standard assessment and sensitivity test were 29.0µg/m³ and 37.7µg/m³ respectively (both at ER5). Therefore, it is not expected that the 1-hour limit of 200µg/m³ will ever be breached.

5.8.5. 2023 Annual Mean PM₁₀ Concentrations

As with the NO₂ assessment, PM₁₀ concentrations have been quantified using the EPUK/IAQM impact assessment. The highest PM₁₀ concentration with development at an existing receptor is 15.6µg/m³ (ER5). The development is predicted to have a negligible impact with respect to PM₁₀ concentrations at all existing receptor locations.

With respect to the proposed development receptors, it is not anticipated that any receptor location on the proposed development would exceed the annual mean objective for PM₁₀. The highest PM₁₀ concentration identified at a proposed sensitive location is 15.0µg/m³ (all locations). Accordingly, it is considered that PM₁₀ in 2023 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future users of the site from exceedances of PM₁₀.

Table 5.13: Modelled 2023 PM₁₀ Concentrations

Receptor	Air Quality Objective (µg/m ³)	Total PM ₁₀ Without Development µg/m ³ (Days >50 µg/m ³) ²¹	Total PM ₁₀ With Development µg/m ³ (Days >50 µg/m ³)	Percentage Change Relative to AQAL	Air Quality Impact
DR1	40	N/A	15.0	N/A	N/A
DR2		N/A	15.0	N/A	N/A
DR3		N/A	15.0	N/A	N/A
DR4		N/A	15.0	N/A	N/A
ER1		15.0	15.0	<0.1	Negligible
ER2		15.2	15.2	<0.1	Negligible
ER3		15.5	15.5	<0.1	Negligible
ER4		15.5	15.5	<0.1	Negligible

²¹ Not to be exceeded more than 35 times a year

Receptor	Air Quality Objective ($\mu\text{g}/\text{m}^3$)	Total PM ₁₀ Without Development ($\mu\text{g}/\text{m}^3$) ²¹	Total PM ₁₀ With Development ($\mu\text{g}/\text{m}^3$) (Days >50 $\mu\text{g}/\text{m}^3$)	Percentage Change Relative to AQAL	Air Quality Impact
ER5		15.6	15.6	<0.1	Negligible

5.8.6. 2023 Annual Mean PM_{2.5} Concentrations

As with the NO₂ and PM₁₀ assessments, PM_{2.5} concentrations have been quantified using the EPUK/IAQM impact assessment. The highest PM_{2.5} concentrations with development at an existing receptor is 11.4 $\mu\text{g}/\text{m}^3$ (ER5). The development is predicted to have a negligible impact with respect to PM_{2.5} concentrations at all existing receptor locations.

With respect to the proposed development receptors, it is not anticipated that any receptor location on the proposed development would exceed the annual mean objective for PM_{2.5}. The highest PM_{2.5} concentration identified at a proposed sensitive location is 10.9 $\mu\text{g}/\text{m}^3$ (all locations). Accordingly, it is considered that PM_{2.5} in 2023 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future site users from exceedances of PM_{2.5}.

Table 5.14: Modelled 2023 PM_{2.5} Concentrations

Receptor	Air Quality Objective ($\mu\text{g}/\text{m}^3$)	Total PM _{2.5} Without Development ($\mu\text{g}/\text{m}^3$)	Total PM _{2.5} With Development ($\mu\text{g}/\text{m}^3$)	Percentage Change Relative to AQAL	Air Quality Impact
DR1	25	N/A	10.6	N/A	N/A
DR2		N/A	10.6	N/A	N/A
DR3		N/A	10.6	N/A	N/A
DR4		N/A	10.6	N/A	N/A
ER1		10.7	10.7	<0.1	Negligible
ER2		10.8	10.8	<0.1	Negligible
ER3		11.0	11.0	<0.1	Negligible
ER4		11.0	11.0	<0.1	Negligible
ER5		11.1	11.1	<0.1	Negligible

5.9. Predicted Operation Impact Summary

Having utilised the data in the transport assessment, the proposed development is predicted to have a negligible impact on existing receptors with respect to pollutant concentrations. This is because school traffic is typically spread over one hour in both the morning and afternoon. The result of this is an insignificant change in AADT and subsequent annual mean concentrations.

The modelling of the highest 1-hour NO₂ concentrations has resulted in more distinct changes between the 'no development' and 'with development scenarios'. However, there were no sensitive receptors where a maximum 1-hour concentration would ever exceeded the 1-hour limit value of 200 $\mu\text{g}/\text{m}^3$. Therefore, air quality in the area surrounding the school would remain of good quality.

6. MITIGATION

6.1. Construction Phase

There are a number of Best Practice mitigation measures that can be used by contractors to ensure that the impacts experienced in close proximity to the construction site are minimised. Such measures include:

- On the site boundary, display the name of the site Air Quality Manager/Environmental Site Manager for the site, and contact details for head office;
- Compile a risk-based Dust Management Plan;
- Record details of all dust and air quality complaints made and of all significant air quality incidents.
- Erect solid barriers around the site boundary when dust-generating activities being undertaken for an extensive period;
- Remove dust generating activities from site and cover or screen potentially dusty objects (e.g. stockpiles, goods coming into site);
- Use mains powered generators and switch off vehicles when idle;
- All HDVs leaving the site should have loads covered and utilise wheel washing to reduce trackout;
- Employ dust suppression or minimisation techniques during site operations and ensure dust suppression equipment is accessible; and,
- Minimise drop heights from conveyors and loading shovels, etc.

If Best Practice mitigation techniques are implemented, it is considered that the potential risks from the construction phase would be negligible. A full list of suggested IAQM mitigation measures can be found in Appendix 7.

6.2. Operation Phase

There are no exceedances of the NAQO's at any of the identified sensitive receptors on site by the projected completion year of 2018 through to the fully operational year of 2023. It is therefore not deemed necessary to include mitigation measures for the proposed development.

7. RESIDUAL EFFECTS

7.1. Construction Impacts on Local Air Quality

The implementation of Best Practice mitigation techniques will ensure the formation of dust and long term soiling is minimised as much as practicable. As such, there should be no residual effects from the construction phase.

7.2. Operation Impacts on Local Air Quality

It is not considered that the development will significantly adversely affect air quality in the local area as the development will result in a negligible increase in pollutant concentrations at existing receptors.

8. CONCLUSIONS

During the operation phase, the BREEZE ROADS modelling calculations have predicted that NO₂, PM₁₀ and PM_{2.5} concentrations in both 2018 (initial opening year) and 2023 (year the school reaches maximum capacity) will have a negligible impact on all existing receptors and will also not exceed the NAQO's at any of the proposed development receptors; therefore, mitigation is not required. This conclusion has been reached using the most recent Defra background pollutant concentration levels and emission factors at the time of preparing this report and a sensitivity test using reasonable worst case emissions factors. Additionally, it has been identified that any traffic associated with the development will not adversely affect air quality in the local area.

In terms of the construction phase, the estimated risk associated with the proposed development, assuming that recommended the mitigation measures are put in place is negligible.

Appendices

Appendix 1: Glossary of Terms

AADT	Annual Average Daily Traffic
AAHT	Annual Average Hourly Traffic
AQMA	Air Quality Management Area -An area that a local authority has designated for action, based upon predicted exceedances of Air Quality Objectives.
AQS/ NAQOs	Air Quality Standard/ National Air Quality Objectives - The concentrations of pollutants in the atmosphere, which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive sub groups.
Calendar Year	The average of the concentrations measured for each pollutant for one year. In the case of the AQS this is for a calendar year.
Concentration	The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, micrograms per cubic metre, $\mu\text{g}/\text{m}^3$) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm).
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
EFT	Emissions Factor Toolkit
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicles
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
Nitrogen Oxides	Nitric oxide (NO) is mainly derived from road transport emissions and other combustion processes such as the electricity supply industry. NO is not considered to be harmful to health. However, once released to the atmosphere, NO is usually very rapidly oxidised to nitrogen dioxide (NO ₂), which is harmful to health. NO ₂ and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO _x).
PM₁₀/PM_{2.5}	Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM ₁₀ (less than 10 microns in aerodynamic diameter), but the finer fractions such as PM _{2.5} (less than 2.5 microns in aerodynamic diameter) is becoming of increasing interest in terms of health effects.
$\mu\text{g}/\text{m}^3$	Micrograms per cubic metre of air - A measure of concentration in terms of mass per unit volume. A concentration of 1 $\mu\text{g}/\text{m}^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.

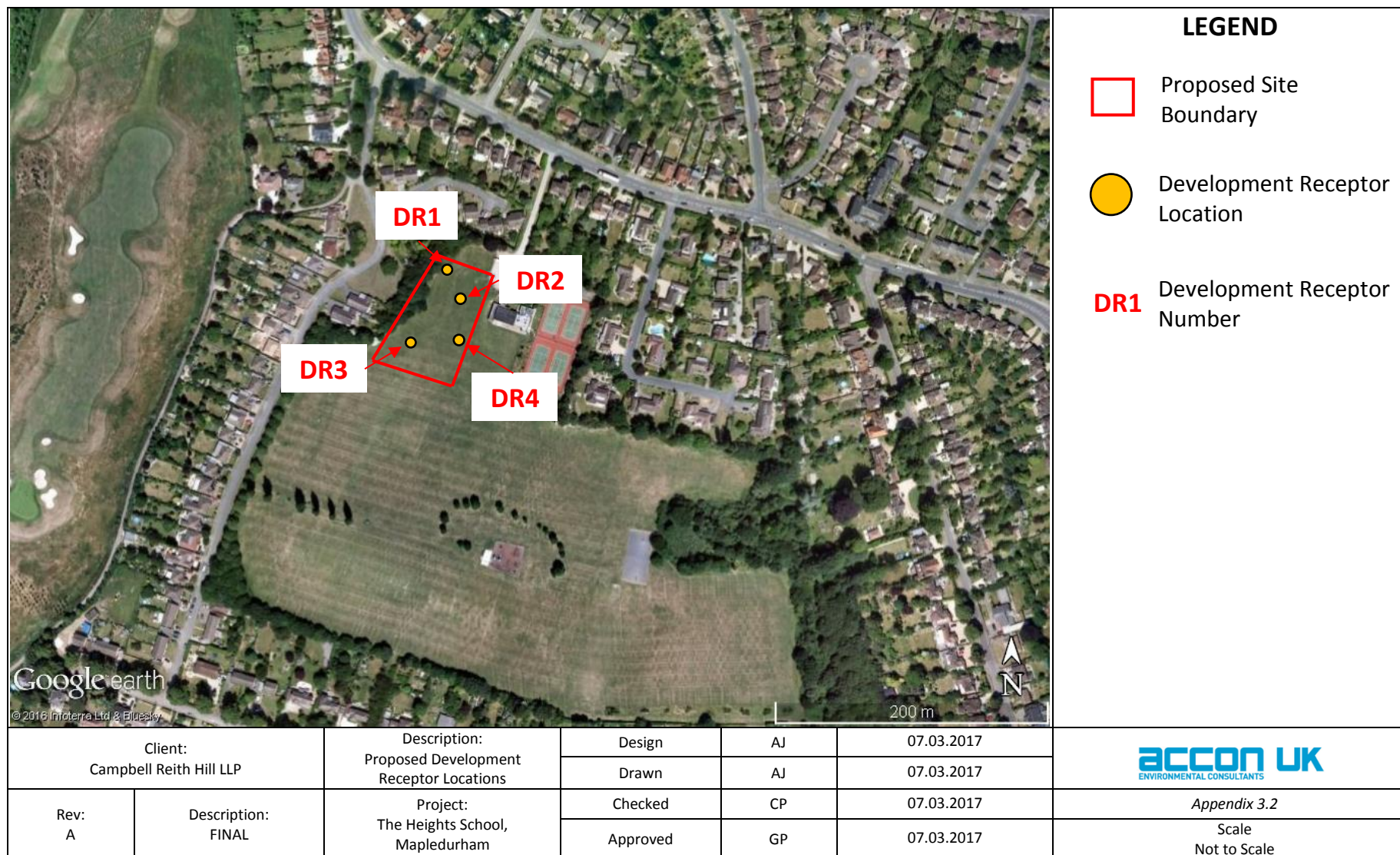
Appendix 2: Receptor Information

Receptor	Floor	Sensitive?	Height (m)	Grid Reference
ER1	Ground	Yes	1.5	469867, 175873
ER2				469889, 175900
ER3				469909, 175935
ER4				469751, 176047
ER5				469957, 175909
DR1	Ground	Yes	1	469808, 175838
DR2			1.5	469816, 175815
DR3				469782, 175789
DR4				469822, 175785

Appendix 3.1: Existing Receptor Locations



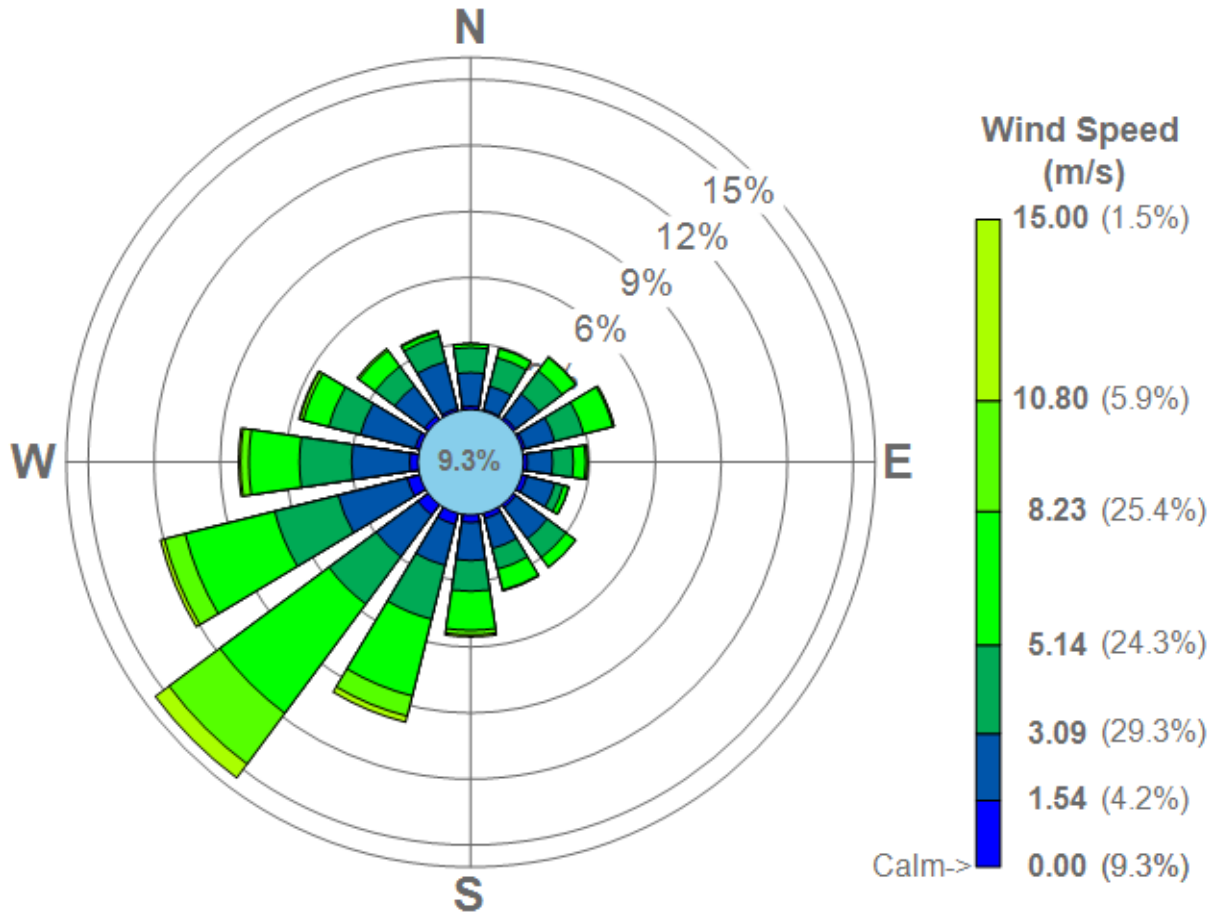
Appendix 3.2: Proposed Development Receptor Locations



Appendix 4: Air Quality Standards

Pollutant	Averaging Period	Limit Value	Margin of Tolerance
Benzene	Calendar Year	5 µg/m ³	
Carbon Monoxide	Maximum daily running 8 Hour Mean	10 mg/m ³	
Lead	Calendar Year	0.5 µg/m ³	100%
Nitrogen Dioxide	One Hour	200µg/m ³ Not to be exceeded more than 18 times per year	
	Calendar Year	40 µg/m ³	
Particles (PM₁₀)	One day	50µg/m ³ Not to be exceeded more than 35 times per year	50%
	Calendar Year	40 µg/m ³	20%
Particles (PM_{2.5})	Calendar Year	25 µg/m ³	20%
Sulphur Dioxide	One Hour	350 µg/m ³ Not to be exceeded more than 24 times per calendar year	150 µg/m ³
	One Day	150 µg/m ³ Not to be exceeded more than 3 times per calendar year	

Appendix 5: 2015 Farnborough Airport Wind Rose



Appendix 6: Construction Dust Assessment Criteria

Appendix 6.1: Dust Emission Magnitude Class Definitions

Emissions Magnitude	Dust Emission Category
Demolition	
Large	Total building volume >50,000 m ³ , potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level.
Medium	Total building volume 20,000 m ³ – 50,000 m ³ , potentially dusty construction material, demolition activities 10-20 m above ground level.
Small	Total building volume <20,000 m ³ construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Earthworks	
<i>Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling the site and landscaping. Example definitions for earthworks are:</i>	
Large	Total site area >10,000 m 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 >8 m in height, total material moved >100,000 tonnes.
Medium	Total site area 2,500 m ² – 10,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m – 8 m in height, total material moved 20,000 tonnes – 100,000 tonnes.
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 <20,000 tonnes, earthworks during wetter months.
Construction	
<i>The key issues when determining the potential dust emission magnitude during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build. Example definitions for construction are:</i>	
Large	Total building volume >100,000 m ³ , on site concrete batching, sandblasting.
Medium	Total building volume 25,000 m ³ – 100,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.
Small	Total building volume <25,000 m ³ construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months.
Trackout	
<i>Factors which determine the dust emission magnitude are vehicle size, vehicle speed, vehicle numbers, geology and duration. As with all other potential sources, professional judgement must be applied when classifying trackout into one of the dust emission magnitude categories. Movements are assessed on a one way journey and number of movements is the maximum over the developments lifetime. Example definitions for trackout are:</i>	
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.
Medium	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.
Small	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

Adapted from the 2016 IAQM Guidance on Assessment of dust from demolition and construction

Appendix 6.2: Defining Dust Receptor Sensitivity

Class	Dust Emission Category	Examples
Dust Soiling Sensitivity (Human)		
High	Users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.	Dwellings, museums/other culturally important collections, medium/long term car parks and showrooms.
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or 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.	Parks and places of work.
Low	The enjoyment of amenity would not reasonably be expected; or property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or 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.	Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
PM₁₀ Health Effects		
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).	Residential properties, hospitals, schools and residential care homes.
Medium	Locations where workers are exposed over a time period relevant to the air quality objective for PM ₁₀ (eight hours or more in a day).	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.	Public footpaths, playing fields, parks and shopping streets.
Ecological Effects		
High	Locations with an international or national designation and the designated features may be affected by dust soiling; or 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.	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; or locations with a national designation where the features may be affected by dust deposition	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	Local dust sensitive nature reserves.

Adapted from the 2016 IAQM Guidance on Assessment of dust from demolition and construction

Appendix 7: Construction Mitigation Measures

Adapted from the 2016 IAQM Guidance on Assessment of dust from demolition and construction

Key:

H Highly Recommended
D Desirable
N Not Required

Mitigation Measures - Communications	Low Risk	Medium Risk	High Risk
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
2. 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.	H	H	H
3. Display the head or regional office contact information	H	H	H

Mitigation Measures - Dust Management	Low Risk	Medium Risk	High Risk
4. 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. The DMP may include monitoring of dust deposition, dust flux, realtime PM10 continuous monitoring and/or visual inspections.	D	H	H
Site Management			
4. 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.	H	H	H
5. 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.	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H
7. 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.	H	H	H

8. Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.	N	N	H
Monitoring			
9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary	D	D	H
10. 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	H	H	H
11. 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.	H	H	H
12. Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	N	H	H
Preparing and Maintaining the Site			
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period	D	H	H
16. Avoid site runoff of water or mud.	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H
18. 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.	D	H	H

19. Cover, seed or fence stockpiles to prevent wind whipping.	D	H	H
Operating Vehicle/Machinery and Sustainable Travel			
20. Ensure all on-road vehicles comply with similar requirements to those of the London Low Emission Zone and the London NRMM standards, where applicable	H	H	H
21. Ensure all vehicles switch off engines when stationary - no idling vehicles	H	H	H
22. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable	H	H	H
23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	D	D	H
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials	N	H	H
25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	N	D	H
Operations			
26. 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.	H	H	H
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
28. Use enclosed chutes and conveyors and covered skips.	H	H	H
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
30. 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.	D	H	H
Waste Management			

31. Avoid bonfires and burning of waste materials.	H	H	H
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Mitigation Measures for Demolition	Low Risk	Medium Risk	High Risk
32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
33. 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.	H	H	H
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
35. Bag and remove any biological debris or damp down such material before demolition.	H	H	H

Mitigation Measures for Earthworks	Low Risk	Medium Risk	High Risk
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N	D	H
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	N	D	H
38. Only remove the cover in small areas during work and not all at once	N	D	H

Mitigation Measures for Construction	Low Risk	Medium Risk	High Risk
39. Avoid scabbling (roughening of concrete surfaces) if possible.	D	D	H
40. 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.	D	H	H
41. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	N	D	H

42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D
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Mitigation Measures for Trackout	Low Risk	Medium Risk	High Risk
43. 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.	D	H	H
44. Avoid dry sweeping of large areas.	D	H	H
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
47. Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	D	H	H
50. 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.	N	H	H
51. Access gates to be located at least 10 m from receptors where possible.	N	H	H



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