

Report for:

John Filbee Properties Limited

750-752 Oxford Road, Reading

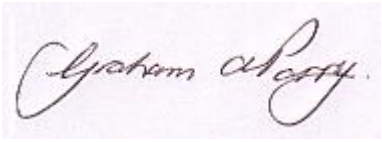
Air Quality Assessment

Status: FINAL

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750-752 Oxford Road, Reading

Air Quality Assessment

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1. INTRODUCTION

ACCON UK Limited (ACCON) have been commissioned by John Filbee Properties Limited to carry out an air quality assessment for the proposed development of 750-752 Oxford Road, Reading. There is one Air Quality Management Area (AQMA) in Reading which covers Reading Town Centre, areas along the major radial road routes into Reading (including J11 of the M4) and along the railway lines where they pass through built-up areas. The AQMA was declared in August 2009.

The site currently comprises a two storey building containing two retail units and a car park to the rear of the building which is accessed from Pangbourne Street. The proposed development consists of eight residential flats over three storeys.

This assessment has been completed in order to determine whether the proposed development achieves compliance against the National Air Quality Objectives, along with National and Local planning policy.

This assessment will be undertaken in accordance with the Department for Environment, Food and Rural Affairs' (DEFRA's) current Technical Guidance on Local Air Quality Management (LAQM) (DEFRA, 2009) and will cover 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; PM_{2.5}) at the site. A glossary of terms is detailed in **Appendix 1** and the location of the site is displayed in **Appendix 2**. The constraints that existing air quality may have on the proposed development have been considered as part of this assessment. It is anticipated that the development will be completed in 2017.

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 National Air Quality Objectives (NAQO) and Limit values and relevant guidance.

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 emissions¹. 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.

Private car ownership has grown from 20.5 million in 1994 to 28.5 million in 2009² and in 2008, car traffic accounted for 78 per cent of road traffic, this proportion has remained stable since 1980³. Whilst total pollutant emissions peaked in 1990/91 and then started to decline, emissions began increasing again in approximately 2010.

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) 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*

¹ Environmental Protection UK. (2010). Car Pollution. Available from www.environmental-protection.org.uk

² Department for Transport. (2010). Regional Transport Statistics: Tables. Available from www.dft.gov.uk

³ Department for Transport. (2010). Transport Trends 2009. Available from www.dft.gov.uk

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 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 2010 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 3**.

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 3**.

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 properties, 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 properties⁴. 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/m³ (Laxen and Marner, 2003). 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.

Similarly, studies (DEFRA, 2003) 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

⁴ 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.

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 Local Development Framework Core Strategy (Adopted January 2008, Alteration adopted January 2015)

Policy CS34: 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; where it would preserve or ideally enhance ground and surface water quality; and where existing water resources, sewerage and wastewater treatment infrastructure are adequate to support the proposed development.

Proposals for development that are sensitive to the effects of air, noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution.

Development will be permitted on land affected by contamination where it can be demonstrated, to the satisfaction of the LPA, that the contamination can be satisfactorily remediated so that it is suitable for the proposed end use.

2.3.4. Reading Borough Local Development Framework Sites and Detailed Policies Document (Adopted October 2012)

DM19: air quality

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

- i. 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.
- ii. 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.
- iii. Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring.

3. BASELINE CONDITIONS

3.1. 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 latest Air Quality Report (2013) states that there is one Air Quality Management Area, which covers Reading Town Centre, areas along the major radial road routes into Reading (including J11 of the M4) and along the railway lines where they pass through built-up areas. The AQMA was declared in August 2009.

Further details on the monitoring data used for model verification purposes are provided in **Section 3.2.**

3.2. Local Air Quality Monitoring

By selecting the closest appropriate roadside monitoring locations to the site, the most representative monitoring locations used for model verification purposes were within 1km of the proposed development site. Four appropriate locations in close proximity to the development site have been chosen including the automatic monitor on the Oxford Road west of the junction of Winslet Place and three diffusion tubes at 689, 744 and 762 Oxford Road.

The 2014 annual mean NO₂ concentrations for all of the monitoring sites are shown in **Table 3.1** below. The annual mean NO₂ NAQO is exceeded at all of the diffusion tube locations but does not exceed at the automatic monitor.

Table 3.1: Local Monitoring Data Suitable for Model Verification

Location	Distance to nearest Kerb (m)	Grid Reference		2014 Annual Mean NO ₂ (µg/m ³)
		X	Y	
Oxford Rd Auto	5.5	468700	174126	35.4
DT25	5.0	468978	173895	45.0
DT26	2.5	468967	173935	55.5
DT68	4.0	468915	173967	44.2

3.3. Background Concentration of Air Pollutants

Background concentrations of air pollutants for the modelling were obtained from the 2011 pollutant concentration maps which were published by DEFRA in June 2014. These updated maps are based on monitoring and meteorological data for 2011 and incorporate updated road forecasts and NO_x emission rates.

Because the background concentrations from DEFRA are mapped in 1km by 1km grid squares and the monitoring stations and development receptors are located in different grid squares compared to the development site, their respective background concentrations have been used for verification and adjustment purposes.

Table 3.2: Background Concentrations of Pollutants

Year	NO _x µg/m ³	NO ₂ µg/m ³	PM ₁₀ µg/m ³	PM _{2.5} µg/m ³
2014 Development Site, Oxford Road Automatic Monitor and all DTs (468500, 173500)	25.91	17.44	17.21	12.18
2017 Development Site, Oxford Road Automatic Monitor and all DTs (468500, 173500)	23.80	16.20	16.71	11.73

Note: The ratio between PM₁₀ and PM_{2.5} in 2014 at the site is 0.71.

Table 3.2 shows 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.

4. METHODOLOGY AND ASSESSMENT CRITERIA

4.1. Methodology

In the UK, the Department for Environment, Food & Rural Affairs (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 TG (09) published in February 2009. The methodology in TG (09) 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
- Reading Borough Council's most recent (2014) air quality data.

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 (NO₂), 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 (version 6.0.2, December 2014) 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.

Meteorological data from the nearby Farnborough Meteorological Station has been used in the model. Sensitive receptors are also included in the model, focusing on the proposed

residential properties on the site. The receptor locations used in this model are displayed in **Appendix 2**.

4.4. Local Air Quality Management Technical Guidance (2009) Recommendations

The Local Air Quality Management Technical Guidance (TG (09)) 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.	

4.5. Applying the AQS to this Development

This planning application includes rooms which will be used for residential purposes, 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.

4.6. 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.

4.7. 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, the following construction activities have therefore been assumed:

- site clearance and preparation;
- landscaping;
- construction and fabrication processes;
- internal and external finishing and refurbishment; and
- materials handling, storage, potential spillage and disposal.

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, proximity to sensitive receptors, prevailing wind direction, complexity of terrain and any barriers between 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 Establishment (Control of Dust from Construction and Demolition Activities, 2003) and the recent document produced by the Institute of Air Quality Management (Guidance on the Assessment of Dust from Demolition and Construction, 2014).

Following the release of the IAQM Guidance in January 2014, 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 this guidance; 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.

According to IAQM guidance (2014), 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 the effects of demolition, earthworks and construction when they are situated within 200m of the site boundary. However, depending on the development size, the effects of trackout may be experienced up to 500m from the site exit.

According to the Windrose in **Appendix 4**, the prevailing wind direction in the region is south-westerly. As such, it is expected that receptors located to the north-east of the site will be at most risk of construction dust impacts without mitigation.

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

4.8. Operation Phase

The main pollutants of concern for road traffic are generally considered to be NO₂ and PM₁₀. Once construction has been completed, it is not anticipated that the proposed development will have a significant effect on local pollution concentrations as there will be only be 10 parking spaces on site. As a result it is considered that the traffic generation onto the local highway network associated with the development will be insignificant.

The Breeze Roads methodology has been used for this assessment to predict the constraints on development. For the assessment, the following scenarios were considered:

- 2014 Model Verification; and
- 2017 Opening Year.

4.9. Identification of Relevant Receptors

To assess the constraints on development, sensitive receptor locations were identified on the façades of the building where the annual mean NAQOs are likely to apply, such as bedrooms and the common room (communal lounge). The Development Receptor plans in **Appendix 2** identify the Development Receptor (DR) locations.

4.10. Traffic Data

The Breeze prediction model requires the user to provide various input data, including the Annual Average Hourly (AAHT) flow, the proportion of heavy duty vehicles (HDVs), the distance of the road centreline from the receptor and the vehicle speed. Traffic speeds have been estimated from local speed restrictions. Vehicle speeds near junctions, crossings and bus stops were revised downwards to account for queuing traffic.

The traffic information utilised for this assessment is detailed in **Table 4.6** and **Table 4.7** below for both the verification and assessment scenarios. Traffic flow data used in the predictions have been obtained independently from the Department for Transport website. The data has been adjusted for the proposed occupation date of 2017 using a worst case traffic growth factor of 1.5% per year between the surveyed years and 2017.

Table 4.6: Traffic Flow Data for Verification (2014)

Location	AAHT	Speed (km/h)	HDV (%)
Model Verification			
Oxford Road	13,150	32	7.0

Due to the number of junctions in the area, the free flow speed is not expected to exceed 32kph under normal conditions. Speeds were also reduced at junctions

Table 4.7: Traffic Flow Data Opening Year (2017)

Location	AAHT	Speed (km/h)	HDV (%)
Model Adjustment			
Oxford Road	13,751	32	7.0

Due to the number of junctions in the area, the free flow speed is not expected to exceed 32kph under normal conditions. Speeds were also reduced at junctions

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.

In respect of NO₂ concentrations, this exercise resulted in an average difference between the modelled and monitored NO₂ roads results of -84.9% (-51.3% for NO₂ total), which indicates that the models are significantly under predicting. When the monitored and modelled results are compared, as recommended in TG.09, the road NO_x adjustment factor is **7.9256** (as shown in **Table 4.8**). 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 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 TG.09.

Table 4.8: NO₂ Annual Mean Verification for 2014

Site	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 ⁵ µg/m ³	Road NO ₂ µg/m ³	Road NO _x µg/m ³			
Oxford Road Auto	17.9	38.2	3.6	7.0	-40.6	19.6	7.9256
DT25	27.6	62.4	3.0	5.9	-54.6	-13.7	
DT26	38.1	92.5	5.6	11.2	-58.4	-2.2	
DT68	26.8	60.3	4.0	7.8	-51.5	1.6	

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 4.9**) are not currently incorporated into

⁵ Obtained from NO_x to NO₂ Calculator Spreadsheet available from <http://lagm.defra.gov.uk/>

Local Air Quality Management regulations, therefore there is no statutory obligation to review and assess air quality against them.

Table 4.9: 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 µg/m ³	2010
Annual mean	Limit value of 25 µg/m ³	2015
Annual mean	Stage 2 indicative limit value of 20µg/m ³	2020
3 year Average Exposure Indicator (AEI) ⁶	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) ⁶	Exposure concentration obligation of 20µg/m ³ (of vegetation)	2015

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 25µg/m³.

⁶ 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.

5. IMPACTS ON AIR QUALITY

5.1. Predicted Construction Impacts

The main source of dust and PM₁₀ during construction activities include:

- Haulage routes, vehicles and construction traffic;
- Materials handling, storage, stockpiling, potential spillage and disposal;
- Exhaust emissions from site plant;
- Site preparation;
- Construction and fabrication processes; and
- Internal and external finishing and refurbishment.

The majority of the releases are likely to occur during the typical 'working-week'. 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 Windrose in **Appendix 4** shows that the prevailing wind direction for the site is from the south-west. Therefore, properties within 200m to the north-east of the site have the greatest potential to be affected by construction dust. The risk of effects are summarised in **Table 5.1** below.

Table 5.1: Summary of Risk Effects with No Mitigation

Source	Dust Soiling Effects	Ecological Effects	PM ₁₀ Effects
Demolition	Not applicable	Not applicable	Not applicable
Earthworks	Not applicable	Negligible risk	Not applicable
Construction	Low risk	Negligible risk	Low risk
Trackout	Low risk	Negligible risk	Low risk

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

5.2. Air Quality Impact of Traffic - Acceptability Criteria

It is common in the UK to use the Environmental Protection UK's (EPUK) Guidance⁷ 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 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;

⁷ Environmental Protection UK (2010 Update) – Development Control: Planning for Air Quality

- 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

In 2014, the average number of vehicles per day on Oxford Road was 13,150 vehicles. Over time, the transport sector is expected to grow by approximately 1.5% per year, which will bring this daily traffic flow up to approximately 13,751 vehicles by 2017, the opening year of the proposed development.

The current development plans only includes 10 parking spaces for the units and it is anticipated that the development could only be generated a maximum of eighty traffic movements in a day. Therefore the development will not have an adverse impact on air quality in respect of traffic generation onto the local highway network.

5.4. Predicted Constraints on Development

To characterise the air quality at the proposed development, predictions of air pollutant concentrations have been made for an occupation year of 2017 using the Breeze Roads dispersion model. The results of the predictions which include the road NO_x adjustment factor (**Table 4.8**) can be seen in **Tables 5.2 to 5.4**.

5.5. Annual Mean NO₂ Concentrations

In terms of the development receptors, the highest predicted NO₂ concentration at the site is 41.9µg/m³. **Table 5.2** shows that in 2017, there will be exceedances of the annual NO₂ NAQO along the front façade of the ground floor of the development.

5.6. NO₂ 1-hour Exposure Assessment

According to guidance, there is only a risk that the NO₂ 1-hour objective (200µg/m³) could be exceeded if the annual mean NO₂ concentration is greater than 60µg/m³. At the development site, the worst case annual mean predicted is 41.9µg/m³; therefore hourly exceedances would not be expected.

Table 5.2: Predicted NO₂ Concentrations 2017

Receptor Locations	Receptor ID	Air Quality Objective Level $\mu\text{g}/\text{m}^3$	Total NO ₂ Do-Something $\mu\text{g}/\text{m}^3$
Ground Floor	DR01	40	41.0
	DR02	40	41.9
	DR03	40	31.8
	DR04	40	31.3
First Floor	DR05	40	33.8
	DR06	40	34.2
	DR07	40	29.7
	DR08	40	29.2
Second Floor	DR09	40	26.6
	DR10	40	26.9
	DR11	40	26.5
	DR12	40	26.2

5.7. Annual Mean PM₁₀ Concentrations

The highest predicted annual PM₁₀ concentration at the site is $19.2\mu\text{g}/\text{m}^3$. The pollutant concentrations in **Table 5.3** have been compared to the annual mean limit value for PM₁₀ and it is apparent that the concentrations at the site are significantly below the Objective Level. Accordingly, it is considered that mitigation will not be required.

The number of days exceeding the $50\mu\text{g}/\text{m}^3$ limit is below the 35 days Objective identified in the NAQO at the modelled receptor locations. Accordingly, it is considered that PM₁₀ in 2017 will not be a constraint on the development of the site, and that no mitigation measures are necessary to protect the future residential occupants from exceedances of PM₁₀.

5.8. PM₁₀ 24-hour Exposure Assessment

There are no exceedances of $32\mu\text{g}/\text{m}^3$ as an annual mean PM₁₀ predicted concentration; therefore exceedances of the 24-hour mean objective are unlikely with the implementation of the proposed development.

Table 5.3: Predicted PM₁₀ Concentrations 2017

Receptor Locations	Receptor ID	Air Quality Objective Level $\mu\text{g}/\text{m}^3$	Total PM ₁₀ Do-Something $\mu\text{g}/\text{m}^3$ (Days >50 $\mu\text{g}/\text{m}^3$) ⁸
Ground Floor	DR01	40	19.1 (2)
	DR02	40	19.2 (3)
	DR03	40	18.2 (2)
	DR04	40	17.8 (1)
First Floor	DR05	40	18.4 (2)
	DR06	40	18.4 (2)
	DR07	40	18.0 (1)
	DR08	40	17.9 (1)
Second Floor	DR09	40	17.7 (1)
	DR10	40	17.7 (1)
	DR11	40	17.8 (1)
	DR12	40	17.6 (1)

5.9. Annual Mean PM_{2.5} Concentrations

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 concentrations at the site are well below the Objective Level. In terms of the development receptors, a maximum concentration of 13.6 $\mu\text{g}/\text{m}^3$ was calculated using the PM₁₀ predicted concentration and the ratio between PM₁₀ and PM_{2.5}. Accordingly, PM_{2.5} in 2017 will not be a constraint on the development of the site, and no mitigation measures are necessary to protect the future residential occupants from exceedances of PM_{2.5}.

⁸ Not to be exceeded more than 35 times a year

Table 5.4: Predicted PM_{2.5} Concentrations 2017

Receptor Locations	Receptor ID	Air Quality Objective Level µg/m ³	Total PM _{2.5} Do-Something µg/m ³
Ground Floor	DR01	25	13.6
	DR02	25	13.6
	DR03	25	12.9
	DR04	25	12.9
First Floor	DR05	25	13.0
	DR06	25	13.1
	DR07	25	12.7
	DR08	25	12.7
Second Floor	DR09	25	12.5
	DR10	25	12.6
	DR11	25	12.5
	DR12	25	12.5

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 minimal. If Best Practice mitigation techniques are implemented, it is considered that the potentially significant impact from the construction phase would be negligible.

6.2. Operation Phase

For the opening year, exceedances of the annual mean NAQO for NO₂ have been identified on the ground floor on the southern (Oxford Road) façade of the proposed development site.

As a result, it is deemed necessary to consider the implementation of measures to minimise the future occupiers' exposure to air pollution and air pollutants within those properties. Therefore it is recommended that ventilation, for all of the residential parts of the development which exceed the NAQO, is installed as part of the development.

Based upon the assessment in **Section 5**, if a building ventilation strategy is utilised, the system would be required to improve internal air quality. It is recommended that mechanical ventilation, drawing air from parts of the development which do not exceed the NAQO, is included for the affected room(s).

It is considered that the exceedances are a result of the relatively high background pollutant concentrations and the influence of the adjacent Oxford Road. As a result, it is deemed necessary to consider the implementation of measures to minimise the future occupiers' exposure to air pollutants on the affected floors. The rooms which are likely to be subject to exceedances of the annual mean NAQO in this development include habitable rooms (living rooms, kitchens, bedrooms, etc.)

Based upon the assessment in **Section 5**, a mechanical ventilation system would be required to improve internal air quality for these rooms at the affected façades of the development, as the internal air quality in naturally ventilated rooms would undoubtedly have similar attributes to the external air. As the exceedances for NO₂ are modelled at all of the first floor receptors and on the front facing façade (facing on to Oxford Road), air could be drawn from the rear or the roof of the development.

Unopenable windows to the front of the proposed development may be an option, however residents are likely to want to open their windows particularly during evenings and weekends when pollutant concentrations from traffic will be lower. Additionally, trickle vents should not be included within the windows facing Oxford Road on the ground floor.

7. RESIDUAL EFFECTS

7.1. Construction Impacts on Local Air Quality

The implementation of Best Practice mitigation techniques will ensure that dust and the harmful emissions of particulate matter from the site are minimised as much as practicable during the construction phase. As such, the likely significant impact from the construction phase will reduce to negligible to low with the implementation of Best Practice mitigation.

7.2. Operation Impacts on Local Air Quality

As the development does not make provision for any significant on-site parking, the development traffic associated with the development is likely to be insignificant; therefore the development should not adversely affect air quality in the local area.

8. CONCLUSIONS

During the construction phase, the estimated magnitude of impacts associated with the proposed development, assuming the mitigation measures recommended in **Section 6.1** are implemented, is negligible.

In terms of the operation phase, Breeze Roads calculations have predicted that there will be no exceedences of the annual or 24-hour mean PM₁₀ NAQOs. The NO₂ annual mean concentrations will exceed the relevant NAQO at three receptors along the front façade on the ground floor of the development.

The affected façade is identified in **Section 6.2** and if the mitigation recommended is implemented, there should not be any constraints relating to air quality on the development.

Additionally, as the development does not make provision for any significant on-site parking, it is considered that any potential generated traffic will have a negligible impact on local air quality and existing sensitive receptors alongside the local highway network.

Appendix 1

Glossary of Terms

Appendix 1: Glossary of Terms

Air Quality Standard (AQS): 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.

Air Quality Management Area (AQMA): An area that a local authority has designated for action, based upon predicted exceedances of Air Quality Objectives.

Benzene: A VOC which is a minor constituent of petrol. The main sources of benzene in the atmosphere in Europe are the distribution and combustion of petrol. Of these, combustion by petrol vehicles is the single biggest source (70% of total emissions).

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).

Exceedance: A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Objective.

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 (NO₂), which is harmful to health. NO₂ and NO are both oxides of nitrogen and together are referred to as nitrogen oxides (NO_x).

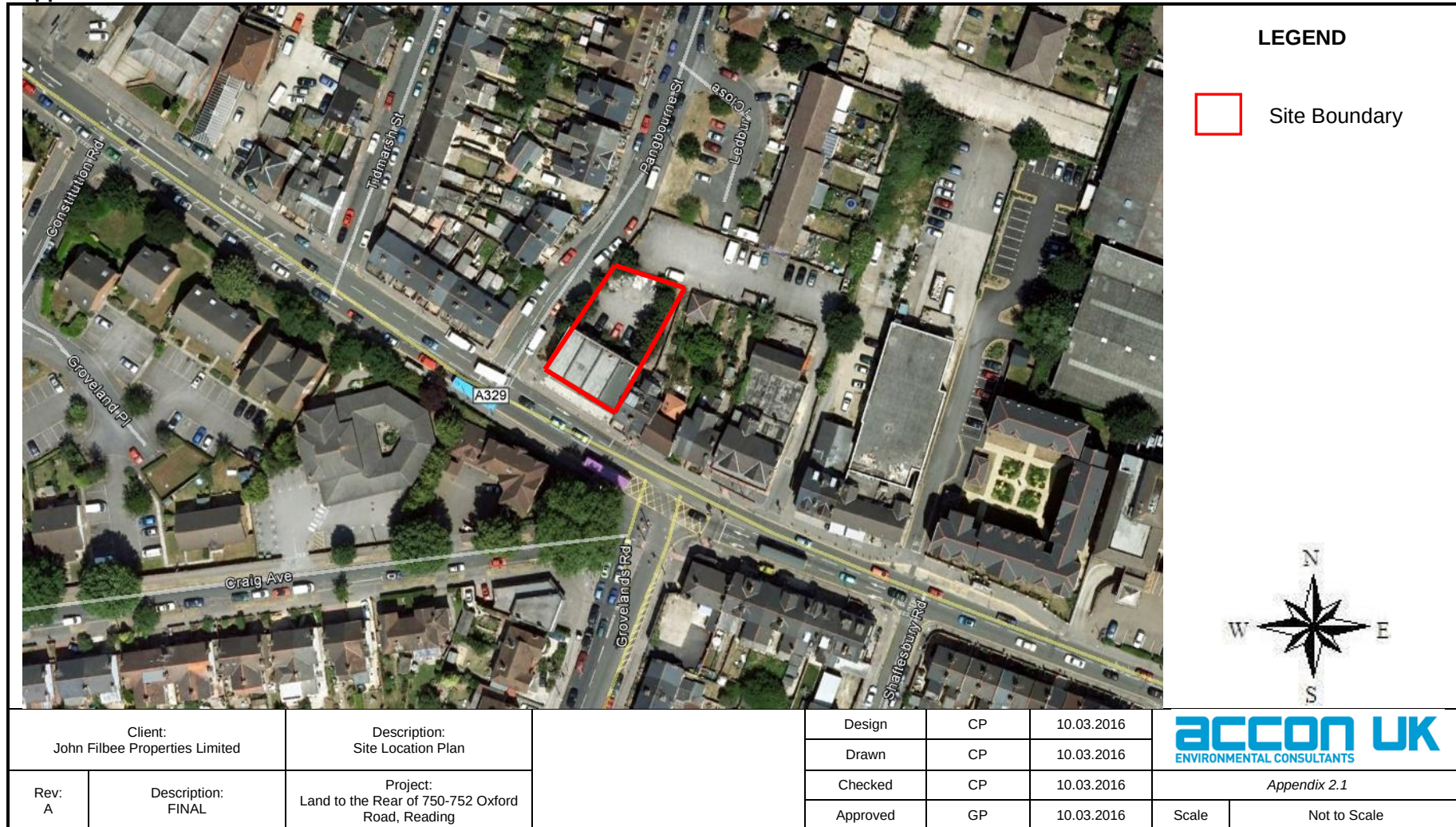
Particulate Matter: Fine Particles are composed of a wide range of materials arising from a variety of sources including combustion sources (mainly road traffic), and coarse particles, suspended soils and dust from construction work. Particles are measured in a number of different size fractions according to their mean aerodynamic diameter. Most monitoring is currently focused on PM₁₀ (less than 10 microns in aero-dynamic diameter), but the finer fractions such as PM_{2.5} (less than 2.5 microns in aero-dynamic 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

Site Location and Proposed Development Plans with Development Receptors

Appendix 2.1: Site Location Plan



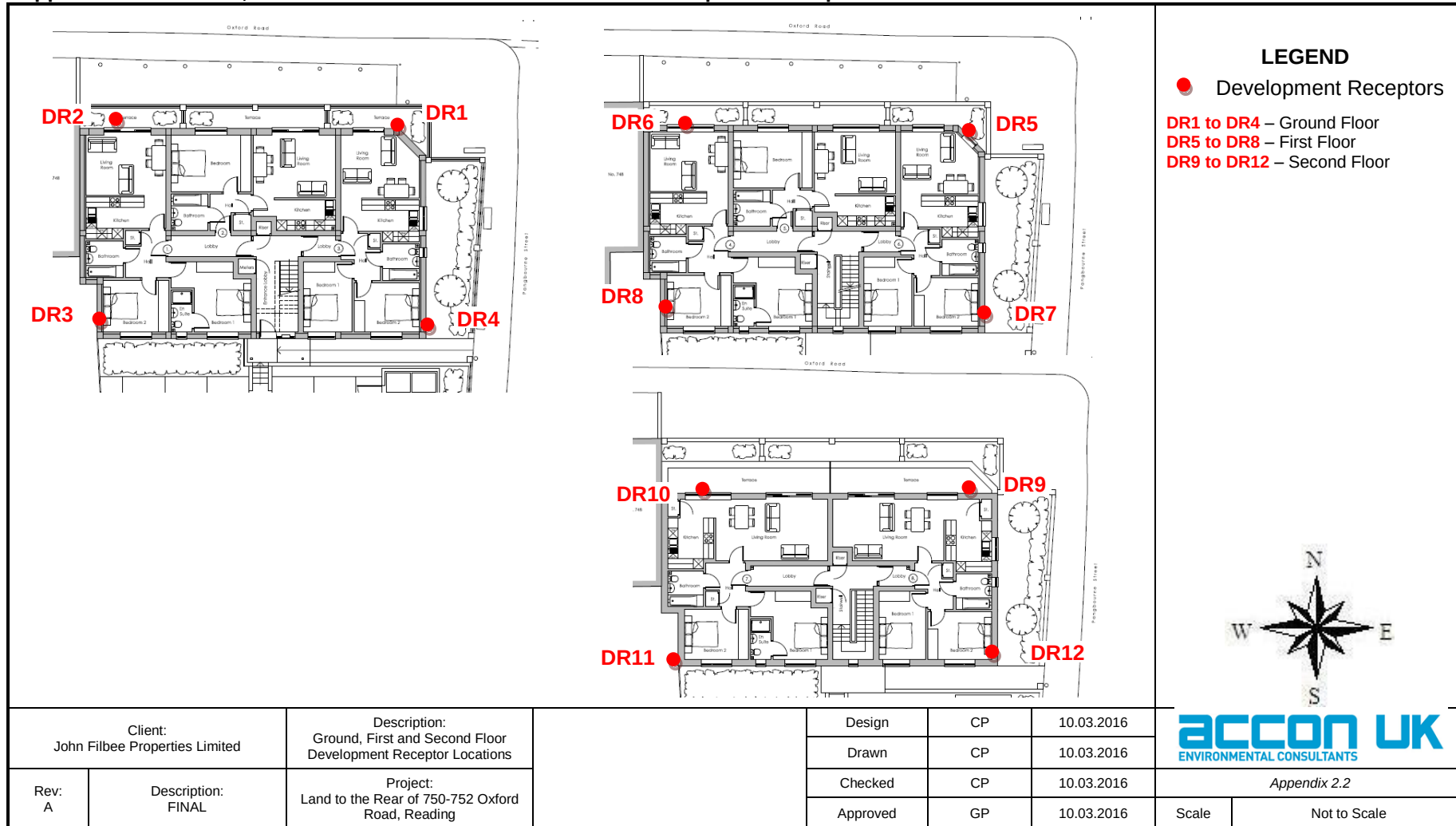
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Appendix 2.2: Ground, First and Second Floor Site Plan with Development Receptor Locations



Appendix 3

Air Quality Standards

Appendix 3: Air Quality Standards

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

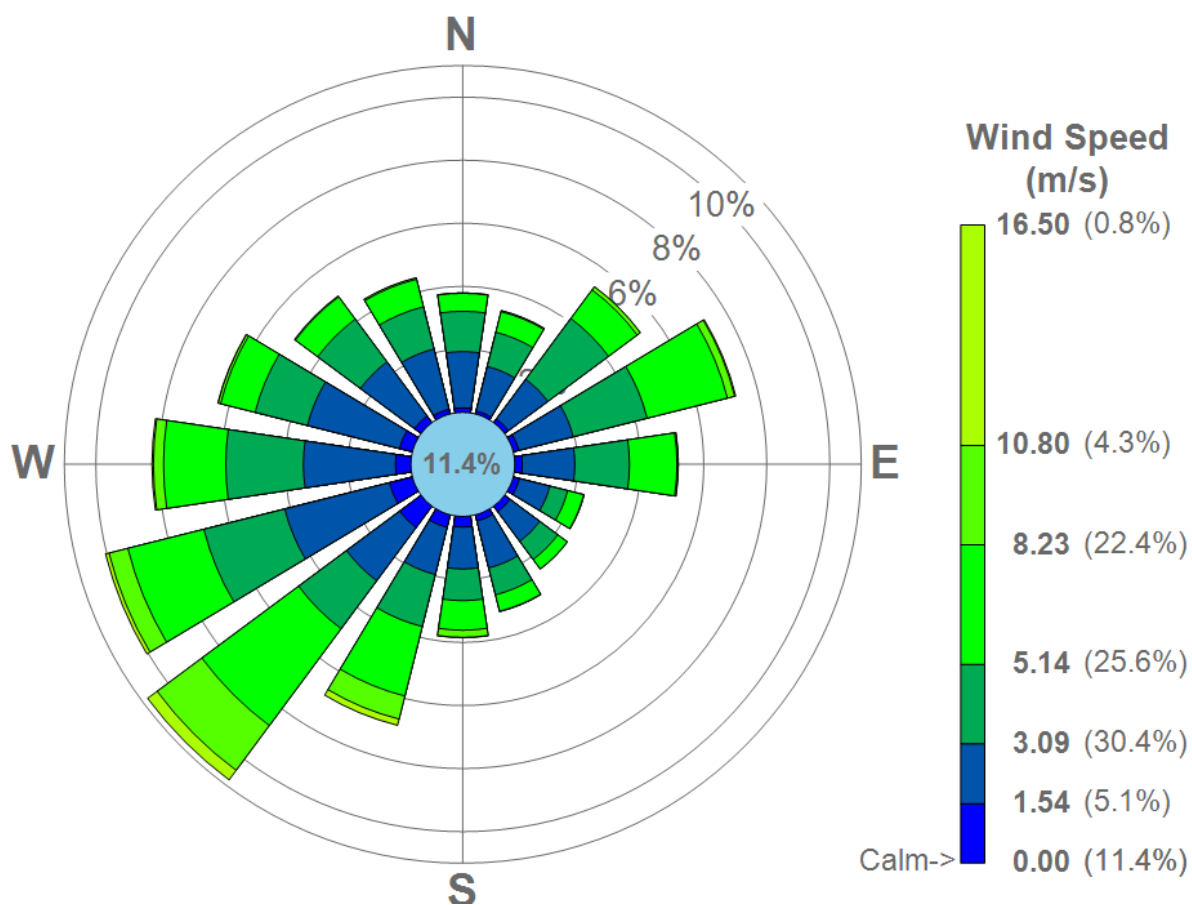
Notes:

µg/m³ - micrograms per cubic metre
mg/m³ - milligrams per cubic metre

Appendix 4

Farnborough Meteorological Station Windrose

Appendix 4: Farnborough Meteorological Station Windrose





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