Report for:

Rider Levett Bucknall UK Limited

Bradford College, Thornton Road, Bradford

Air Quality Assessment

Status: Final

Date: 24.08.2023

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Date	24.08.2023
Version Number	A4891/AQ/02
Status	Final

Contents

1. Introduction 5
2. Air Pollution Policy Context 6
2.1. Legislation 6
2.2. Clean Air Strategy 8
2.3. The Environment Act 2021 9
2.4. The National Planning Policy Framework 10
2.5. Local Planning Policy - Bradford Council Core Strategy Development Plan Document (2017) 12
3. Site Description and Baseline Conditions 14
3.1. Site Description 14
3.2. Air Quality Review and Assessment 14
3.3. Local Air Quality Monitoring 15
3.4. Background Concentration of Air Pollutants 15
4. Methodology of Assessment and assessment criteria 16
4.1. Methodology 16
4.2. Breeze Roads Modelling of Pollutant Concentrations 16
4.3. Model Set-up Parameters 16
4.4. Assessment Criteria 17
4.5. Operational Phase 17
4.6. Traffic Data 17
4.7. Validation and Verification of the Model 18
5. Impacts and Constraints of Air quality 20
5.1. Operational Impact Assessment 20
6. Mitigation 22
6.1. Operation Phase 22
7. Conclusions 23
Appendices 24
Appendix 1: Glossary of Terms 25
Appendix 2: Air Quality Standards 26
Appendix 3: 2019 Bingley No.2 27
Appendix 4: Proposed Development Receptors – Ground Floor 28

List of Tables

Table 2.1: UK Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$ 7

Table 2.2 Examples of where AQS should be applied 8

Table 3.1: Local Monitoring Data Suitable for Model Verification 15

Table 3.2: Background Concentrations of Pollutants 15

Table 4.1: 2019 Traffic Flow Data for Verification 18

Table 4.2: 2025 Opening Year Traffic Flow Data 18

Table 4.3: NO_2 Annual Mean Verification for 2019 19

Table 5.1: Modelled 2025 NO_2 Concentrations – Development Receptors 20

Table 5.2: Modelled 2025 PM_{10} and $PM_{2.5}$ Concentrations – Development Receptors 21

1. INTRODUCTION

ACCON UK Limited (ACCON) has been commissioned by Rider Levett Bucknall UK Limited to carry out an Air Quality Assessment for the proposed development at Bradford College, BD7 1AY.

The proposed development is for the demolition of an existing building and the construction of a new technology centre for the college.

The site is located within the administrative boundary of the City of Bradford Metropolitan District Council (CBMDC). The site is located within the Bradford Clean Air Zone (CAZ) and is approximately 10m away from the Thornton Road AQMA, which is located on the other side of the road to the site, as identified in Figure 3.1.

This assessment has been completed in order to determine whether the proposed development achieves compliance against the National Air Quality Objectives (NAQOs), along with National and Local Planning Policy. The 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.TG22.)[1] and considers the effects of local air quality on the development.

The report assesses the overall pollutant concentrations of nitrogen dioxide (NO_2) and particulates (PM_{10} 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 shown in Section 3.1. The development plan for the site with development receptor locations is identified in Appendix 4. It is estimated that the proposed development would be completed and occupied in 2025 (at the earliest), subject to receiving planning approval.

The potential air quality constraints on the development have been assessed on the basis of the findings of detailed dispersion modelling using Breeze Roads GIS Pro Version 5.1.8, which has been undertaken in the context of relevant NAQOs, emission limit values and relevant guidance.

[1] DEFRA, Local Air Quality Management Technical Guidance 2021.

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2. AIR POLLUTION POLICY CONTEXT

2.1. Legislation

2.1.1. Air Quality Strategy and Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 requires the Secretary of State to publish an air quality strategy and local authorities to review and assess the quality of air within their boundaries.[2] The latter has become known as Local Air Quality Management (LAQM), which commenced in 1997, an instrument by which the Government's air quality objectives are to be achieved over a determined period of time.

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1) provides the policy framework for local air quality management and assessment in the UK. It sets out air quality standards and objectives for key air pollutants which are designed to improve air quality and protect human health and the environment from the effects of pollution. For the purpose of the strategy, the terms are defined below:

> standards are 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 subgroups or on ecosystems.
>
> objectives are policy targets often expressed as a maximum ambient concentration not to be exceeded, either without exception or with a permitted number of exceedances, within a specified timescale.

The air quality standards and objectives are outlined in Appendix 2.

As part of this LAQM role, Local Authorities are required to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. Where a local authority identifies areas of non-compliance with the Air Quality Objectives[3] of pollutants of concern, and there is relevant public exposure, there remains a statutory need to declare the geographic extent of non-compliance as an Air Quality Management Area (AQMA) and to draw up an action plan detailing appropriate measures and policies that can be introduced in order to work towards achieving the objective(s).

[2] In 1997, the United Kingdom National Air Quality Strategy (NAQS) was published in response to the Environment Act of 1995, setting out a framework of standards and objectives for the air pollutants of most concern (SO_2, PM_{10}, NOx, CO, lead, benzene, 1,3-butadiene and tropospheric ozone), to be achieved by local authorities through a system of Local Air Quality Management (LAQM) by 2005. The aim of the strategy was to reduce the air pollutant impact on human health by reducing airborne concentrations. A review of the NAQS led to the publication of Air Quality Strategy for England, Scotland, Wales and Northern Ireland in January 2000, whilst in July 2007 was further reviewed with various amendments to the Air Quality Objectives for local authorities.

[3] Defra, 2022, Local Air Quality Management Technical Guidance (TG22)

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The objectives for use by Local Authorities are prescribed within the Air Quality (England) Regulations 2000[4], and the Air Quality (England) (Amendment) Regulations 2002[5]. The AQOs for pollutants included within the Air Quality Strategy and assessed as part of the scope of this report are summarised in Table 2.1. The objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004 respectively and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. It should be noted that Local Authorities in England have a flexible role in working towards reducing emissions and concentrations of $PM_{2.5}$.

Table 2.1: UK Air Quality Objectives for NO_2, PM_{10} and $PM_{2.5}$

Pollutant	Objectives	Averaging Period
Nitrogen dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean
	40µg/m^3	Annual mean
Particulate Matter ($PM_{2.5}$)*	Work towards reducing emissions/ concentrations of fine particulate matter ($PM_{2.5}$)	Annual mean

*The $PM_{2.5}$ objective, which is to be met by 2020, is not in (Air Quality England) Regulations and there is no requirement for local authorities to assess it, although they are encouraged to do so.

The AQS objectives apply at locations where members of the public are likely to be regularly present and exposed over the averaging period of the objective. Table 2.2 identifies examples of where the annual mean objectives should apply as provided in TG22[6], and include: building facades of residential properties[7], schools, hospitals, etc. The annual mean objectives are not relevant for the building facades of offices or other places of work where members of the public do not have regular access, kerbsides or gardens. 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.

[4] The Stationary Office (2000) Statutory Instrument 2000, The Air Quality (England) Regulations 2000, London
[5] The Stationary Office (2002) Statutory Instrument 2002, The Air Quality (England) (Amendment) Regulations 2002, London
[6] 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.
[7] Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.

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Table 2.2 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.	

*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 adjustment should always be applied.

2.2. Clean Air Strategy

The Clean Air Strategy 2019[8] was released in January 2019 and supersedes the policies featured in The National Air Quality Strategy. The strategy mainly deals with how to improve air quality in England but also discusses air quality policy in the devolved administrations. In comparison with the previous strategies, it has a more joined-up approach, incorporating transport, domestic, industrial and agricultural emission reduction policies with a combined focus on both ambient and indoor air quality. The plan also has an emphasis on the proposal to use Clean Air Zones (CAZs) and the ULEZ (in London) to quickly bring highly polluted urban centres below the legal limits. Some of the key policies in the plan are a renewed consideration of under-used Smoke Control Areas due to the

[8] DEFRA, 2019, The Clean Air Strategy 2019

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growth of highly polluting domestic wood burning stoves, new best practices being incorporated into the agricultural sector to reduce ammonia emissions (and their associated secondary particulates) and with a policy to prohibit the sale of new petrol and diesel cars by 2040. However, air quality objective limits outlined in the document are largely unchanged from the previous strategy.

2.3. The Environment Act 2021

The Environment Act 2021 establishes a legally binding duty on government to bring forward at least two new air quality targets in secondary legislation by 31 October 2022. This duty sits within the environmental targets framework outlined in the Environment Act (Part 1).

The proposed air quality targets are:

> Annual Mean Concentration Target ('concentration target') - a maximum concentration of 10μg/m^3 to be met across England by 2040
>
> Population Exposure Reduction Target ('exposure target') - a 35% reduction in population exposure by 2040 (compared to a base year of 2018).

The amendments to the Environment Act 1995 made through the Bill will:

> Strengthen the local air quality management (LAQM) framework to enable greater cooperation at local level and broaden the range of organisations that play a role in improving local air quality. Responsibility for tackling local air pollution will now be shared with designated relevant public authorities, all tiers of local government and neighbouring authorities.
>
> Increase transparency and accountability by requiring the Secretary of State to regularly review the Air Quality Strategy at least every 5 years, and to publish an annual statement to Parliament on progress towards achieving air quality standards and objectives.

The amendments to the Clean Air Act 1993 made through the Bill will help local authorities reduce pollution from domestic burning, which contributed 38% of $PM_{2.5}$ emissions in 2019. Specifically, the amendments will:

> Replace the criminal offence of emitting smoke from a chimney in a smoke control area with a civil penalty regime, which allows for the removal of the statutory defences that currently hinder enforcement. This will enable quicker, simpler and more proportionate enforcement at a local level against the emissions of smoke within a smoke control area (SCA).
>
> Give local authorities powers to address pollution from solid fuel burning on inland waterway vessels (for example, canal boats) in smoke control areas.
>
> Strengthen the offences in relation to the sale and acquisition of certain solid fuels for use in smoke control areas, by removing the limit on the fine for delivering unapproved solid fuels to a building in a smoke control area, and requiring retailers of solid fuels to notify customers

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that that it is illegal to buy unapproved fuel for use in a smoke control area unless burning in an approved appliance.

Amendments to the Environmental Protection Act 1990 allow local authorities to take more substantive action against those who repeatedly emit smoke and endanger human health by extending the system of statutory nuisance to private dwellings in SCAs. Smoke from chimneys that causes a nuisance could result in a local authority issuing an abatement notice. Breaching such a notice is a criminal offence and could result in the payment of fine, as is already the case outside SCAs.

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 Statutory Instrument 2023 No.96 has now been made by the Secretary of State and the targets are identified below:

By the end of 31st December 2040, the annual mean level of $PM_{2.5}$ in ambient air must be equal to or less than 10 µg/m³.

At least a 35% reduction in population exposure by the end of 31st December 2040, as compared with the average population exposure in the three-year period from 1st January 2016 to 31st December 2018.

2.4. The National Planning Policy Framework

The National Planning Policy Framework (NPPF) was first published on 27th March 2012 and updated on 24th July 2018, 19th February 2019, and 20th July 2021. The policy sets out the government's planning policies for England and how these are expected to be applied.

The NPPF[9] "sets out the Government's planning policies for England and how these should be applied and provides a framework within which locally-prepared plans for housing and other development can be produced." It includes advice on when air quality should be a material consideration in development control decisions. Relevant sections are set out below:

Section 9 - Promoting sustainable transport:

Paragraph 105

*"*The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health. However, opportunities to maximise sustainable transport solutions will vary between urban and rural areas, and this should be taken into account in both plan-making and decision-making…*"*

[9] Ministry of Housing, Communities and Local Government, 2019, National Planning Policy Framework

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Section 15 - Conserving and enhancing the natural environment:

Paragraph 174 Bullet point 'e':

> "Planning policies and decisions should contribute to and enhance the natural and local environment by:
>
> (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

Paragraph 186:

> "Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

The NPPF is accompanied by relevant planning practice guidance (PPG)[10], a web-based resource which brings together planning guidance on various topics into one place. Specific guidance in respect to air quality is provided where the guiding principles on how planning can take account of the impact of new development on air quality is included. The PPG states that:

> "Whether 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 have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."

The PPG sets out the information that has to be considered when deciding whether an air quality assessment may be required for a planning application, stating that:

> Where air quality is a relevant consideration the local planning authority may need to establish:
>
> the 'baseline' local air quality, including what would happen to air quality in the absence of the development;

[10] GOV.UK. (2014). Air quality. [online] Available at: https://www.gov.uk/guidance/air-quality--3 [Accessed 07 October 2020].

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whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and

whether occupiers or users of the development could experience poor living conditions or health due to poor air quality.

It also provides guidance on options for mitigating air quality impacts, and makes clear that:

*"*Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure 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:

maintaining adequate separation distances between sources of air pollution and receptors;

using green infrastructure, in particular trees, where this can create a barrier or maintain separation between sources of pollution and receptors;

appropriate means of filtration and ventilation;

including infrastructure to promote modes of transport with a low impact on air quality (such as electric vehicle charging points);

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.

2.5. Local Planning Policy - Bradford Council Core Strategy Development Plan Document (2017)

CBMDC's Core Strategy refers to one policy with respect to Air Quality, this is Policy EN8 – Environmental Protection, which states:

*"*In order to protect public health and the environment the Council will require that:

Proposals which are likely to cause pollution or are likely to result in exposure to sources of pollution (including noise, odour and light pollution) or risks to safety, will only be permitted if measures can be implemented to minimise pollution and risk to a level that provides a high standard of protection for health, environmental quality and amenity. The following issues require particular attention:

A. Air Quality

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In liaison with partner organisations, the Council will take a proactive approach to maintaining and improving air quality within the District in line with both National Air Quality Standards, the European Union limit values and the principles of best practice. Through a range of actions, it will seek to secure a reduction in emissions from sources which contribute to poor air quality.

Development proposals that have the potential to adversely impact on air quality will be required to incorporate measures to mitigate or offset their emissions and impacts, in accordance with the Low Emission Strategy for Bradford and associated guidance documents.

In areas where air quality is a matter of concern, development proposals will be required to deliver a positive impact on air quality in the district.

Development proposals must not exacerbate air quality beyond acceptable levels; either through poor design or as a consequence of site selection."

2.5.1. Relevant Guidance

2.5.2. Local Air Quality Management Technical Guidance (TG22)

The Technical Guidance "Local Air Quality Management Technical Guidance (TG22)" (LAQM.TG22) supersedes all previous versions. It is designed to support local authorities in carrying out their duties under the Environment Act 1995 as amended by the Environment Act 2021 and subsequent regulations. LAQM is the statutory process by which local authorities monitor, assess, and take action to improve local air quality.

2.5.3. Land-Use Planning & Development Control: Planning for Air Quality (IAQM, 2017)

This guidance[11] has been produced by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) to ensure that air quality is adequately considered in the land-use planning and development control process. This guidance, of itself, can have no formal or legal status and is not intended to replace other guidance that does have this status. This document has been developed for professionals operating within the planning system. It provides them with a means of reaching sound decisions, having regard to the air quality implications of development proposals. It also is anticipated that developers will be better able to understand what will make a proposal more likely to succeed. This guidance is particularly applicable to assessing the impacts of traffic and energy centre emissions and provides advice how to describe air quality impacts and their significance.

[11] Moorcroft and Barrowcliffe. et al. (2017) Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.

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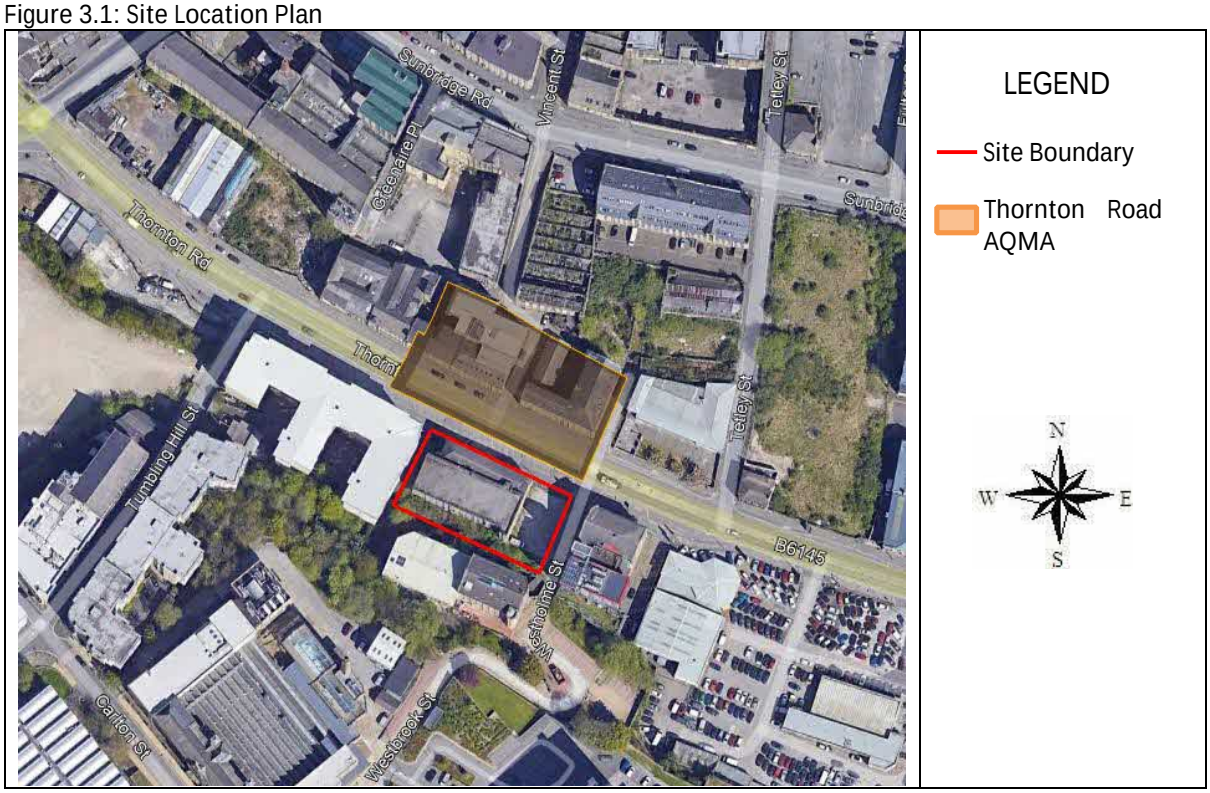
3. SITE DESCRIPTION AND BASELINE CONDITIONS

3.1. Site Description

The site is located directly to the south of Thornton Road with Westholme Street directly to the east of the site. Thornton Road AQMA Order 3, which came into force on the 1st September 2006, is located approximately 10m north of the proposed development site.

The location and the red line boundary of the site are detailed below in Figure 3.1.

Figure 3.1: Site Location Plan



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. CBMDC Air Quality Annual Status Report 2020[12] provides the most recent available robust air quality monitoring results for the CBMDC (2019). Whilst, an Annual Status Report has been published for 2022, the monitoring results were affected by the pandemic and therefore the data has not been

[12] 2020 Air Quality Annual Status Report (ASR) for the City of Bradford Metropolitan District Council.

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relied upon. Details of the monitoring data used for pollutant concentration model verification purposes are provided in Section 3.3.

3.3. Local Air Quality Monitoring

CBMDC monitors local air quality through an automatic monitor and diffusion tube monitoring network. The monitoring sites chosen for verification of the air quality modelling were both automatic monitor and diffusion tubes sites as there was publicly available traffic data for these sites.

The 2019 annual mean NO_2 concentrations for the monitoring sites are identified in Table 3.1. The annual mean NO_2 NAQO was not exceeded at any of the monitoring sites.

Table 3.1: Local Monitoring Data Suitable for Model Verification

Monitor Site Number	Grid Reference		2019 Annual Mean NO_2 (µg/m^3)	2019 Data Capture (%)
	X	Y		
DT108 - Thornton Road LP 24 after Street NO_x	415858	433061	32	100
DT109 - Thornton Road LP below Street NO_x	415891	433045	31	100
DT110 - Thornton Road LP adj to the student accommodation	415806	433061	27	100

3.4. Background Concentration of Air Pollutants

Background concentrations of air pollutants for the modelling were obtained from the DEFRA pollutant concentration maps[13]. Table 3.2 identifies the background pollutant concentrations at the diffusion tube monitoring locations and the proposed development site. The estimated background map concentrations for the annual mean NO_2 and PM_{10} used in the assessment are below the annual mean objective limit of 40µg/m^3 in 2019 and 2025.

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
Verification - 2019 415500, 433500	29.13	20.09	12.87	8.78
Development Site - 2025 415500, 433500	23.09	16.42	11.99	8.14

Note: In 2025 the ratio between PM_{10} and $PM_{2.5}$ at the proposed Development Receptors is 0.68.

[13] DEFRA, Background Mapping Data for Local Authorities- 2018 [online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

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4. METHODOLOGY OF ASSESSMENT 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 (TG22)[14] published in August 2022. The methodology in TG22 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 NO_2 calculator to derive NO_2 concentrations from the NO_x outputs from Breeze Roads modelling. This is because NO_2 concentrations within the model are otherwise predicted using the CALINE4 NO_x to NO_2 conversion methodology, which should not be used within the model as current evidence shows that the proportion of primary NO_2 in vehicle exhausts has increased since the model was developed, which would affect the relationship between NO_x and NO_2 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 CBMDC.

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 PM_{10} can be calculated.

4.3. Model Set-up Parameters

The most recent Emissions Factor Toolkit (EFT, version 11.0, November 2021) issued by DEFRA was used to derive emissions rates (in grams per kilometre) for vehicle movements along roads incorporated into the model.

Briefly, the changes between v10.1 and v11.0 are as follows:

[14] DEFRA, 2022, Local Air quality Management Technical Guidance (TG22)

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EFT 11.0 allows users to define Input Years up to 2050.

- 2031 - 2050 outputs are limited to England (not London) only.
- Emissions outputs for the years 2031-2050 are provided in support of climate assessments and appraisals only. Where emissions are to be used after 2030 to inform air quality assessments, the appropriate caveats around the limitations of the analysis must be included to accompany the assessment.

Updated fleet splits for England (not London) to extend the fleet data for Motorway, Urban and Rural Road types out to 2050.

It is noted that the default fleet projections in EFT v11.0 are based on fleet growth assumptions which were current before the Covid-19 outbreak in the UK. In consequence, default fleet outputs from the tool do not reflect short- or longer-term impacts on emissions in 2020 and beyond resulting from behavioural change during the national or local lockdowns.

Meteorological data from Bingley No.2 (2019) has been utilised for the dispersion modelling, which is considered representative of the development area, and the wind rose is shown in Appendix 3.

4.4. Assessment Criteria

A detailed assessment was considered appropriate for this proposed development with model results being verified against local monitoring data. This was undertaken 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 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.

4.5. Operational Phase

The main pollutants of concern are generally considered to be NO_2 and PM_{10} for road traffic. The Breeze Roads methodology has been used for this assessment to predict the constraints on the Site.

For the assessment, the following scenarios were considered:

- 2019 Model Verification; and
- 2025 Future Assessment year.

4.6. Traffic Data

The Breeze Roads prediction model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the number of heavy-duty vehicles (HDVs), the distance of the road centreline from the receptors and vehicle speeds. The traffic information is detailed in Table 4.1 and Table 4.2 below for the verification and assessment scenarios.

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Table 4.1 identifies the traffic data for 2019 which was utilised for the verification. Traffic flow and vehicle split data were obtained from the DfT (2019). Vehicle speeds were based on speed estimations and were subsequently adjusted where it was deemed, they were not sufficiently accurate, e.g. at junctions, crossings, etc.

Table 4.1: 2019 Traffic Flow Data for Verification

Road	AADT	HDV%
B6145 - Thornton Road – southeast of Listerhills Road	15,961	3.5
B6145 - Thornton Road – northwest of Listerhills Road	22,881	2.4

Note: This is a non-exhaustive summary of the road sections modelled and includes the sections that are likely to contribute the greatest emissions.

Table 4.2 identifies the estimated AADT traffic flows for roads near to the proposed development site, with the proposed development fully operational. This data was provided by the transport consultants, The Transportation Consultancy Ltd (TTC).

The proposed development is not anticipated to produce any additional traffic movements per day.

Vehicle speeds were estimated based on local speed limits and traffic conditions and were reduced near junctions and crossings to replicate possible queuing traffic.

Table 4.2: 2025 Opening Year Traffic Flow Data

Road	AADT	HDV (%)
B6145 - Thornton Road – southeast of Listerhills Road	16,061	3.5
B6145 - Thornton Road – northwest of Listerhills Road	23,519	2.4

Note: This is a non-exhaustive summary of the road sections modelled and includes the sections that are likely to contribute the greatest emissions to the development receptors.

4.7. 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 where data is available. 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 TG22. Suitable monitoring data for the purpose of verification is available for concentrations of NO_2 at the monitoring positions detailed in Section 3.3.

When the monitored and modelled results are compared as recommended in TG22 the road NO_X adjustment factor is 5.0692 (as identified in Table 4.3). This factor was applied to all modelled NO_x results prior to calculating modelled NO_2 using the NO_x to NO_2 calculator. In the absence of appropriate PM_{10} monitoring within close proximity to the site, the NO_x adjustment factor has also

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been applied to the PM_{10} modelled concentrations, in accordance with the guidance provided in TG22.

Table 4.3: NO_2 Annual Mean Verification for 2019

Monitoring Position	Monitored		Modelled		% Difference (NO_x Roads) Before Adjustment	% Difference (NO_2 Total) After Adjustment	Road NO_x Factor
	Road NO_2 µg/m^3	Road NO_x[15] µg/m^3	Road NO_2 µg/m^3	Road NO_x µg/m^3			
DT108 - Thornton Road LP 24 after Street NO_x	11.91	23.43	2.07	4.62	-80.30	-0.03	5.0692
DT109 - Thornton Road LP below Street NO_x	10.91	21.37	2.05	4.44	-79.21	1.81	
DT110 - Thornton Road LP adj to the student accommodation	6.91	13.30	1.00	2.17	-83.69	-4.33	

[15] Obtained from NO_x to NO_2 Calculator Spreadsheet available from www.laqm.Defra.gov.uk

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5. IMPACTS AND CONSTRAINTS OF AIR QUALITY

5.1. Operational Impact Assessment

The proposed development is for the demolition of an existing building and the construction of a new technology centre for the college

As the development is not predicted to produce any significant additional traffic movements it is highly unlikely that the development will have an impact on local traffic flows and air quality, as it will not create an increase in traffic of more than 100 AADT, which is the level below which detailed air quality assessments are not usually considered necessary.

5.1.1. Sensitive Receptors Identification

In order to characterise the air quality at the proposed development, predictions of air pollutant concentrations have been carried out for the earliest occupation year of 2025 using the Breeze Roads dispersion model and UK emission factors. Development receptors were modelled at the ground floor of the proposed development as identified in Appendix 4. Higher floors were not modelled as the general trend for pollutant concentrations is to reduce with increasing height, therefore it was only deemed necessary to model pollutant concentrations at the ground floor which is a worst-case scenario. The results of the predictions which include the road NO_X adjustment factor (Table 4.3) can be identified in Tables 5.1 and 5.2.

5.1.2. Air Quality Constraints – 2025 Annual Mean NO_2 Concentrations

Table 5.1 identifies the modelled NO_2 concentrations at the proposed sensitive receptors on the development site for the worst-case scenario for which there will be no exceedances of the AQO.

All of the pollutant concentrations will remain significantly below the annual NO_2 AQO. In respect of the NO_2 1-hour AQO, there is only a risk that the NO_2 1-hour objective (200µg/m^3) could be exceeded at local sensitive receptors if the annual mean NO_2 concentration is greater than 60µg/m^3. Therefore, exceedances of NO_2 1-hour AQO would not be expected as the worst-case annual mean predicted concentration is 18.6µg/m^3 (DR2).

Table 5.1: Modelled 2025 NO_2 Concentrations – Development Receptors

Receptor	Floor	Air Quality Objective (µg/m^3)	NO_2 Road Contribution (µg/m^3)	Total NO_2 (µg/m^3)
DR1	Ground	40	2.0	18.4
DR2			2.2	18.6
DR3			1.1	17.5
DR4			1.1	17.5

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5.1.3. Air Quality Constraints – 2025 Annual Mean Particulate Matter Concentrations

Table 5.2 identifies the modelled PM_{10} and $PM_{2.5}$ concentrations in 2025. Modelled PM_{10} concentrations are predicted to be 12.6µg/m^3 (DR2), and modelled $PM_{2.5}$ concentrations are predicted to be 8.5µg /m^3 (DR1 and DR2), which are significantly below the AQO's.

Table 5.2: Modelled 2025 PM_{10} and $PM_{2.5}$ Concentrations – Development Receptors

Receptor	Floor	PM_{10} Air Quality Objective (µg/m^3)	Total PM_{10} µg/m^3 (Days >50 µg/m^3)	$PM_{2.5}$ Air Quality Objective (µg/m^3)	Total $PM_{2.5}$ µg/m^3
DR1	Ground	40	12.5	25	8.5
DR2			12.6		8.5
DR3			12.3		8.3
DR4			12.3		8.3

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6. MITIGATION

6.1. Operation Phase

As identified by the constraints assessment, there are no exceedances of the NAQO's for NO_2, PM_{10} or $PM_{2.5}$ at any of the proposed development receptors for the projected completion year of 2025. The highest modelled NO_2 and PM_{10} concentrations at sensitive development receptors are 18.6µg/m^3 and 12.6µg /m^3 respectively which are significantly below the annual mean NO_2 and PM_{10} air quality objective values of 40µg/m^3.

Accordingly, no mitigation is required.

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7. CONCLUSIONS

During the operation phase, the Breeze Roads modelling predicts that there will be no exceedances of the nitrogen dioxide or particulate matter objectives at the sensitive development receptors on the proposed development site.

During the operation phase, there will be no additional traffic on the local road network as a result of the development and therefore increases in nitrogen dioxide and particulate matter at existing sensitive receptors will not occur.

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APPENDICES

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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.
AURN	Automatic Urban and Rural Network Air Quality Monitoring Site.
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, $\mu g/m^3$) 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 Vehicle
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).
$PM_{10}/PM_{2.5}$	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 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.
TEMPro	TEMPro is software produced by the DfT to calculate the expected growth of traffic by year on roads throughout the country. The factor varies depending on the region and type of road.
$\mu g/m^3$	Micrograms per cubic metre of air - A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollution.

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Appendix 2: Air Quality Standards

Pollutant	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	
Particulates (PM_{10})	One day	50µg/m^3 Not to be exceeded more than 35 times per year	50%
	Calendar Year	40µg/m^3	20%
Particulates ($PM_{2.5}$)	Calendar Year	25µg/m^3	20%
Sulphur Dioxide	One Hour	350µg/m^3 Not to be exceeded more than 24 times per calendar year	150µg/m^3
	One Day	150µg/m^3 Not to be exceeded more than 3 times per calendar year	

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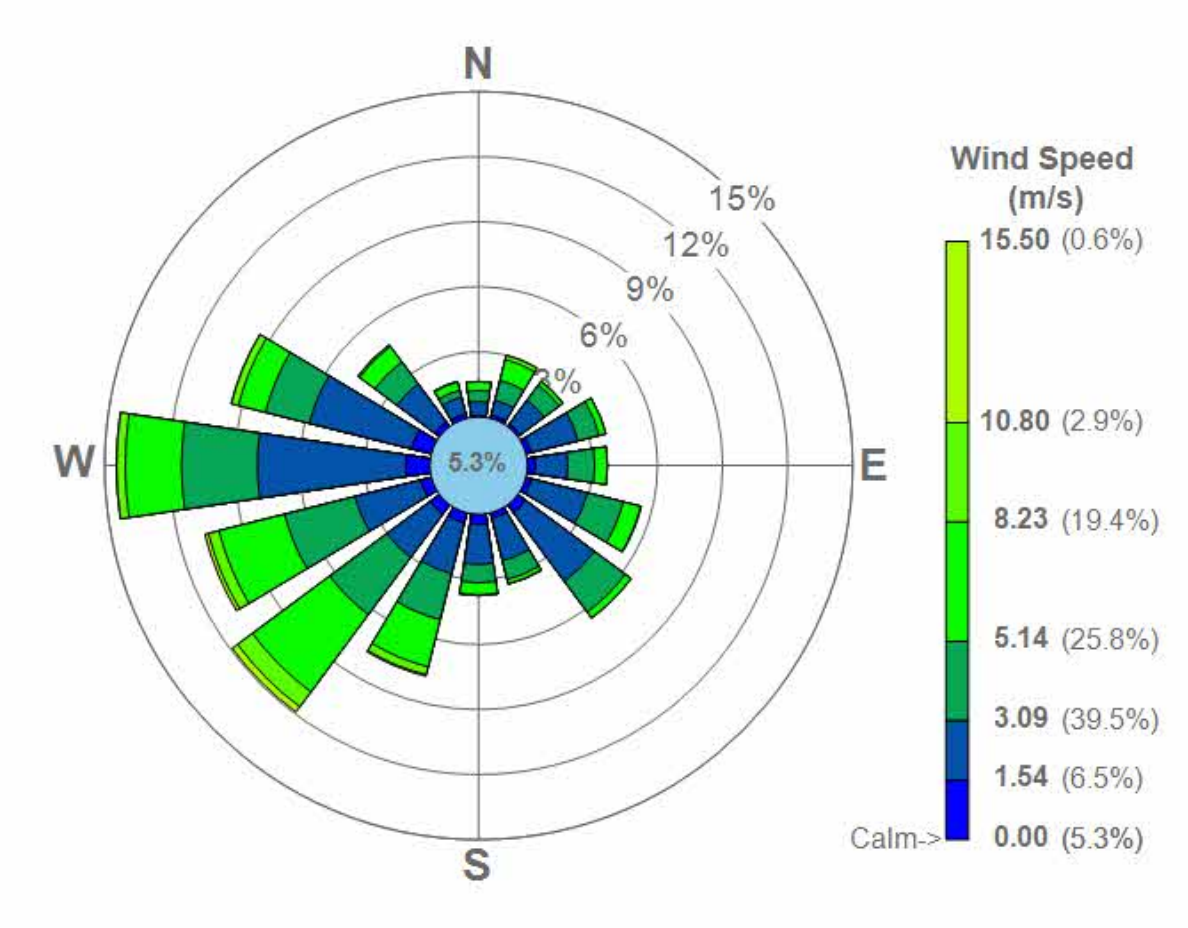
Appendix 3: 2019 Bingley No.2



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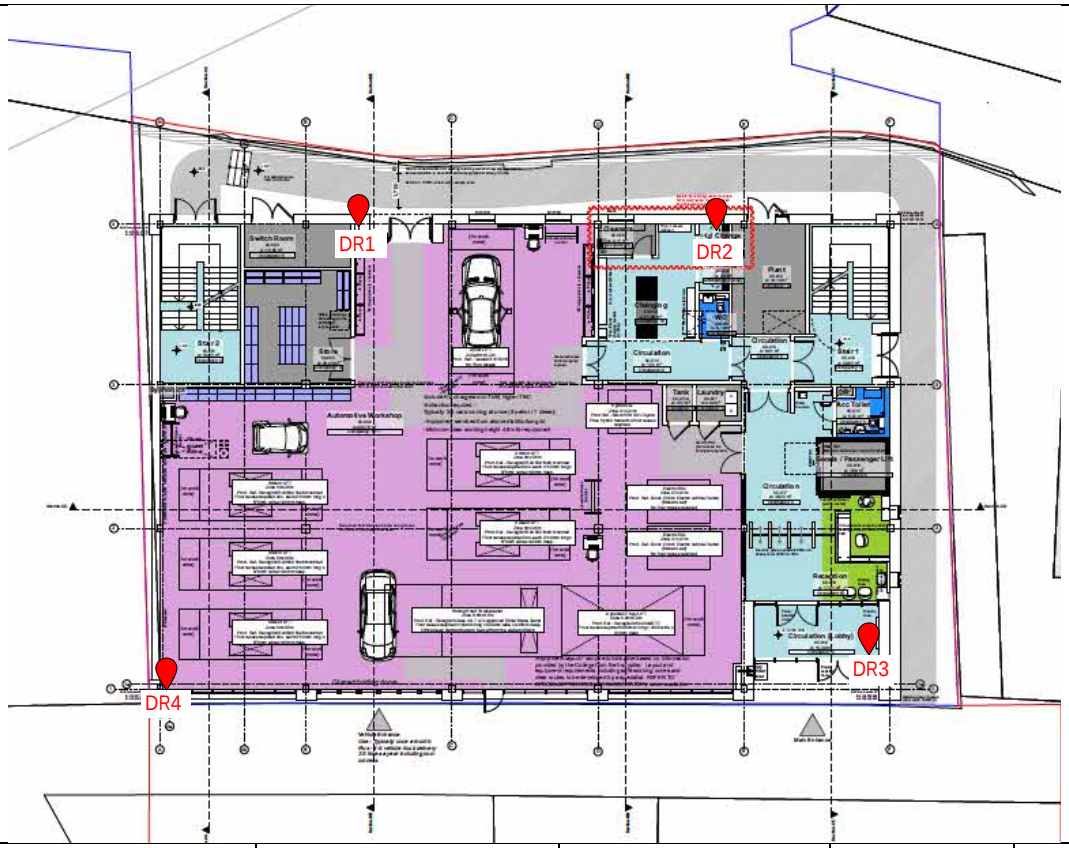
Appendix 4: Proposed Development Receptors – Ground Floor



LEGEND

DR1 Development Receptor Location

Site Boundary

N
W
E
S

Client: Rider Levett Bucknall UK Limited		Proposed Development - Development Receptors – Ground Floor		Design:	HR
				Drawn:	HR
Rev: A	Description: FINAL	Project: Bradford College		Checked:	CP
				Approved:	GP

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Appendix 4

Scale: On Map

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