

HONEYVIEW INVESTMENTS LIMITED

BARNARD ROAD, NORWICH

AIR QUALITY ASSESSMENT

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CONTENTS	Page
1.0 INTRODUCTION	1
2.0 LEGISLATION, POLICY AND GUIDANCE	2
3.0 METHODOLOGY	10
4.0 BASELINE CONDITIONS	19
5.0 PREDICTED IMPACTS	23
6.0 MITIGATION	30
7.0 CONCLUSIONS	35
8.0 REFERENCES	36
 APPENDICES	
APPENDIX A GLOSSARY	38
APPENDIX B IAQM DUST ASSESSMENT APPROACH	40
APPENDIX C MODEL INPUTS AND RESULTS PROCESSING	49
APPENDIX E TRAFFIC DATA AND ROAD NETWORK	53
 FIGURES	
Figure 3-1: Existing Receptor Locations	14
Figure 4-1: Local Monitoring Locations; SNDC	21
 TABLES	
Table 2-1: NO ₂ and PM ₁₀ Objectives	3
Table 2-2: Relevant Exposure	4

Table 3-1: Modelled Receptor Locations	13
Table 3-2: Impact Descriptors for Individual Receptors ^a	17
Table 4-1: Measured Annual Mean NO ₂ Concentrations (µg/m ³)	21
Table 4-2: Predicted Annual Mean Background Concentrations (µg/m ³)	22
Table 4-3: Predicted Annual Mean Baseline Concentrations (µg/m ³)	22
Table 5-1: Risk of Construction Dust Impacts Without Mitigation	25
Table 5-2: Predicted Annual Mean Concentrations of NO ₂ (µg/m ³), % Change and Impact at each Existing Receptor	27
Table 5-3: Predicted Annual Mean Concentrations of PM ₁₀ (µg/m ³), % Change and Impact at each Existing Receptor	27

DOCUMENT CONTROL SHEET

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1.0 INTRODUCTION

Proposed Development

- 1.1 Ardent Consulting Engineers Ltd. (ACE) have been commissioned by Honeyview Investments Limited to carry out an Air Quality Assessment (AQA) in support of the development of a proposed foodstore at Barnard Road, Norwich, within the local planning authority of Norwich City Council (NCC).

Scope

- 1.2 This AQA describes existing air quality within the study area and considers both the suitability of the Site for the proposed development and the potential impact of the proposed development on local air quality during both the construction and operational phases.
- 1.3 The main air pollutants of concern related to the construction phase are dust and particulate matter (PM₁₀) from on-site construction activities and as a result of material tracked out by construction vehicles, and emissions of nitrogen dioxide (NO₂) and particulate matter (PM₁₀) from construction vehicles which may impact on existing sensitive human receptors.
- 1.4 The main air pollutants of concern related to the operational phase are emissions of NO₂ and PM₁₀ associated with operational traffic which may impact on existing sensitive human receptors.
- 1.5 In terms of the suitability of the Site for its intended end-use, the main air pollutants of concern are concentrations of NO₂ within the Site as a result of emissions from the local road network and background pollutant concentrations.
- 1.6 The proposed energy strategy is anticipated to comprise an all-electric heating / cooling strategy, comprising Air Source Heat pumps (ASHPs), Waste Heat and Solare Photovoltaic (PV). None of these proposed energy sources have any associated on-site emissions, therefore, the proposed energy strategy does not have the potential to result in significant effects.
- 1.7 The AQA also includes the recommendation of appropriate mitigation measures, as necessary, based on the outcomes of the assessment.

2.0 LEGISLATION, POLICY AND GUIDANCE

National Air Quality Legislation and Strategy; Human Health

The Air Quality Strategy

- 2.1 The Air Quality Strategy (Defra, 2007) established the policy framework for ambient air quality management in the UK, with the objective of ensuring a quality of ambient air for all that would not pose a significant risk to health or quality of life. This document set out the National Air Quality Objectives (NAQOs) and the policy for achieving them. A revised Air Quality Strategy (Defra, 2023) has since been released, updating the strategy to include consideration of new and revised conditions, legislation and policies. The Air Quality Strategy was produced as a requirement of part IV of the Environment Act (UK Government, 1995) and amended in The Environment Act (UK Government, 2021) which set out a system of Local Air Quality Management (LAQM) requiring local authorities to regularly review and assess air quality within their boundary and appraise plans in light of these assessments.
- 2.2 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) which should include measures expected to ensure that the NAQOs are met within the AQMA.

National Air Quality Objectives

- 2.3 NAQOs were defined by The Air Quality Strategy (Defra, 2007) and enshrined in regulations by the Air Quality Standards Regulation (Statutory Instrument, 2010, No 1001) and Air Quality Standards (Amendment) Regulations (Statutory Instrument, 2016 No. 1184) which implemented the European Union Directive on ambient air quality and cleaner air for Europe (Directive 2008/50/EC). Relevant objectives are set out in **Table 2-1**.

Table 2-1: NO₂ and PM₁₀ Objectives

Pollutant	Time Period	Objective
NO ₂	1-hour mean	200 µg/m ³ not to be exceeded more than 18 times a year
	Annual mean	40 µg/m ³
PM ₁₀	24-hour mean	50 µg/m ³ not to be exceeded more than 35 ¹ times a year
	Annual mean	40 µg/m ³ ²

- 2.4 Analysis of long-term monitoring data suggests that if the annual mean NO₂ concentration is less than 60 µg/m³ then the 1-hour mean NO₂ objective is unlikely to be exceeded where road transport is the main source of pollution (Defra, 2022). This concentration has therefore been used in this AQA to screen whether an exceedance of the 1-hour mean objective is likely. Similarly, an annual mean PM₁₀ concentration of 32 µg/m³ is used to screen whether an exceedance of the 24-hour mean PM₁₀ objective is likely.
- 2.5 The Local Air Quality Management Technical Guidance 2022 (LAQM.TG(22)) (Defra, 2022b) provides guidance to local authorities as to where objectives apply. These are summarised in **Table 2-2**.

¹ 7 times a year for Scotland

² 18 µg/m³ for Scotland

Table 2-2: Relevant Exposure

Averaging Period	Relevant Locations	Objectives should apply	Objectives don't usually apply
Annual mean	Where individuals are exposed for a cumulative period of 6 month in a year	Facades of residential properties, schools and hospitals	Gardens, facades of offices, hotels and shops or kerbside sites
24-hour mean	Where individuals are expected to be exposed for 24-hours or longer	As above, with the addition of hotels and gardens of residences	Kerbside sites and areas where the public is unlikely to spend significant time
1-hour mean	Where individuals are expected to spend one hour or longer	As above, with the addition of locations with regular access such as car parks, bus stations, parks and cafes	Locations not publicly accessible or where occupation is not regular

National Air Quality Plan for Nitrogen Dioxide (NO₂) in the UK

- 2.6 The National Air Quality Plan (Defra and DfT, 2017) was written as a joint venture between the Department for Environment, Food and Rural Affairs (Defra) and the Department for Transport (DfT) and aims to tackle roadside concentrations of NO₂ in the UK. It includes a number of measures such as those aimed at investing in Ultra Low Emission Vehicles (ULEVs) charging infrastructure, public transport and grants to help local authorities in improving air quality.
- 2.7 The plan requires all local authorities in England with areas expected not to meet the Limit Values by 2020 (known as 'air quality hotspots') to develop plans to bring concentrations within these values in "*the shortest time possible*". These plans are to be reviewed by the government and suggestions included in the plan include actions such as utilising retrofitting technologies, changing road layout and encouraging public transport and ULEV use. Where these approaches are not considered sufficient, the local authority may need to consider implementation of a Clean Air Zone (CAZ) which places restrictions on vehicle

access to an area and may include charging certain (or all) vehicles or restrictions on the type of vehicle allowed to access an area.

The Road to Zero Strategy

- 2.8 The 'Road to Zero' strategy (HM Government, 2018) set out the governments aims regarding zero emissions vehicles. These include the aim that all new cars and vans have zero tailpipe emissions by 2040 and for almost every car to be zero emission by 2050. Measures are aimed at encouraging uptake of the cleanest vehicles and supporting electric charging infrastructure.

Clean Air Strategy

- 2.9 The Clean Air Strategy (Defra, 2019) sets out policies to lower national emissions of pollutants in order to reduce background pollution and human exposure. It aims to create a strong framework to tackle air pollution and to reduce the number of people living in locations with PM_{2.5} concentrations exceeding 10 µg/m³ by 50% by 2025.

Planning Policy

National Planning Policy

- 2.10 The National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023) sets out the Government's planning policies for England and how they expect these to be implemented. Consideration of air quality within planning is considered an important element of this framework which recommends that transport and the potential impact on the environment should be considered at an early stage in order to allow for mitigation or even avoidance of impacts through location and layout of developments.
- 2.11 It is recommended that both the impacts of a potential development on the environment and the risk to new development from existing pollution be taken into account when planning policy is drafted. Furthermore these should contribute to compliance with relevant limit values or objectives and should be consistent with any local AQAP.
- 2.12 The NPPF also recommends that *"existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development"*

permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

2.13 The NPPF also states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

- Protecting and enhancing...sites of biodiversity or geological values...*
- minimising impacts on...biodiversity..."*

2.14 The Planning Practice Guidance (PPG) provides guidance on how planning can enact the policies set out in NPPF. It is set out as separate papers for different sectors and therefore the 'Air Quality' PPG (Ministry of Housing, Communities and Local Government, 2019) is aimed at addressing policy relating specifically to air quality. This document gives guidelines for when air quality is likely to be relevant to a planning decision:

"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."

2.15 The 'Air Quality' PPG also states that more detailed information such as whether the development could have a significant impact on air quality, baseline air quality and whether occupiers of the development could experience poor air quality may be required in order to make an informed decision. Further, it notes that any assessment should be proportionate, taking into account the scale of the proposed development, as well as any potential impacts.

2.16 Some suggestions on mitigation measures are set out within the PPG, such as separation distances, filtration/ventilation, green infrastructure, promotion of low emission forms of transport, control of dust and emissions from construction and,

finally, contributing funding to measures such as those identified in AQAPs to offset impacts from the development.

Local Policy

- 2.17 NCC are working with South Norfolk Council (SNC) as well as Norfolk County Council (NCoC) and Broadland District Council (BDC) to prepare the Greater Norwich Local Plan. Until this plan is approved, the existing Local Plans for both NCC and SNC are applicable.

Norwich City Council Local Plan

- 2.18 NCC's Local Plan is made up of several documents, those of which that are relevant to this assessment are detailed below.
- 2.19 NCC adopted their Norwich Development Policies Local Plan in December 2014 which details planning policies intended to help guide and manage change in Norwich up to 2026 (NCC, 2014).
- 2.20 Policy DM11 – Environmental Hazards states:

"... Air and Water Quality

In areas where an Air Quality Management Area (AQMA) has been declared (under the Environment Act, 1995), development which is likely to have an impact on air quality will be required to take particular account of the air quality action plan for that area. Where the action plan identifies poor or deteriorating air quality as an issue in localised areas within the AQMA, development will be required to incorporate measures which will mitigate against the effects of existing or potential further deterioration in local air quality through design, density, disposition of use or travel demand management as appropriate, on a case-by-case basis..."

Norwich City Council Air Quality Action Plan

2.21 NCC adopted an AQAP in June 2021 (NCC, 2021). This plan outlines the actions that NCC intends to take to improve air quality in NCC's area from 2020 – 2025. The main priorities are identified as being the reduction of emissions from public transport and promotion of alternative modes of travel, however, actions are proposed under the following ten different topics:

- Introduction of Low Emissions Zone;
- Reducing vehicle idling through engine switch-off legislation;
- Promoting low emission transport;
- Promoting travel alternatives;
- Alternatives to private vehicle use;
- Transport planning and infrastructure;
- Freight and delivery management;
- Traffic management;
- Policy guidance and development control;
- Public information;
- Vehicle fleet efficiency; and
- Environmental permits.

South Norfolk District Council Core Strategy

2.22 SNDC's Core Strategy forms part of a 'Joint Core Strategy for Broadland, Norwich and South Norfolk' published by the Greater Norwich Development Partnership (Greater Norwich Development Partnership, 2014). There are no relevant policies, applicable to air quality, listed within the strategy.

Assessment Guidance

- 2.23 This assessment has been based on a number of guidance documents, the most significant of which are set out below:

Local Air Quality Management Technical Guidance (LAQM.TG(22))

- 2.24 The LAQM guidance (Defra, 2022) was published for use by local authorities for review and assessment work, but also includes a number of technical guidelines on carrying out modelling assessment and management of monitoring data which set out best practice and are, therefore, relevant to all air quality assessments.

Land-Use Planning and Development Control: Planning for Air Quality

- 2.25 The Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) have published joint guidance on the assessment of air quality impacts for planning purposes (EPUK & IAQM, 2017). This includes information on when an air quality assessment is required, what should be included in an assessment and the assessment of significance.

Guidance on the Assessment of Dust from Demolition and Construction

- 2.26 The IAQM have produced guidance which includes a methodology for identifying the risk magnitude of potential dust sources associated with demolition, construction, earthworks and trackout (IAQM, 2023). This is then used to identify the level of mitigation necessary in order for the overall residual effect to be 'not significant'.

3.0 METHODOLOGY

- 3.1 The methodology set out in the following sections has been identified as being the most appropriate approach to assess potential impacts associated with the proposed development, along with any required mitigation.

Baseline Air Quality

- 3.2 Information regarding the 'current'³ and future⁴ baseline air quality has been obtained by collating the results of nearby local monitoring, referring to maps of AQMAs and, considering any exceedances of the EU Limit Values that are identified by Defra's Pollution Climate Mapping (PCM) model (Defra, 2020a) or measured by any nearby Automatic Urban and Rural Network (AURN) monitoring site(s) and considering predicted background concentrations, which have been defined based on the national pollution maps published by Defra (Defra, 2020b).

Construction Dust Impacts

- 3.3 There is a potential for dust and PM₁₀ from on-site activities and off-site trackout during the construction phase to have an impact on sensitive human and ecological receptors within the study area.
- 3.4 The suspension of dust and PM₁₀ is related to weather conditions and wind direction, ground and particle characteristics and on-site activities. There is a potential for impacts to occur when dust generating activities coincide with dry, windy conditions and where sensitive receptors are located downwind of the dust source.
- 3.5 Separation distance is an important factor as large particles (>30 µm) which are responsible for most dust annoyance largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200-500 m but are less likely to trigger annoyance. Significant annoyance is therefore generally limited to a few

³ The 'current' baseline year for the purposes of this assessment has been taken to be 2022 as this is the most recent year for which representative local monitoring data are available.

⁴ The future baseline year has been taken to be 2023. The proposed development is not anticipated to complete until 2028; as air quality throughout the UK is generally expected to improve in the coming decade, the assumption of 2023 as a future year is very much worst-case, and will result in a conservative assessment.

hundred metres of the source. Small particles (<10 µm) are deposited slowly and may travel up to 1 km. Whilst these particles are responsible for most impacts on human health, impacts are not likely to be experienced at significant distance due to dispersion effects.

- 3.6 The assessment of construction dust effects has been carried out following the IAQM's 'Guidance on the Assessment of Dust from Construction and Demolition' (IAQM, 2023). Within the guidance, an 'impact' is described as a change in pollutant concentration or dust deposition and an 'effect' is described as the consequence of an impact.
- 3.7 The assessment considered three potential dust impacts:
- Loss of amenity due to dust soiling;
 - Human health effects due to an increase in concentrations of PM₁₀; and
 - Harm caused to ecological receptors due to dust deposition.
- 3.8 Full details of the approach taken to assessing dust are provided in **Appendix B**, the stages of the assessment are:
- Identify whether there are sensitive receptors within the relevant distances (study area) for site activities during the construction phase;
 - Assess the risk of dust impacts for each site activity type (demolition, earthworks, construction and trackout) – this includes identifying the emissions magnitude for each activity type, the sensitivity of the area and then combining these factors to identify risk;
 - Identify mitigation measures, based on assessed risk, sufficient to ensure off-site effects are 'not significant'; and
 - Assess impacts with mitigation in place. This should normally result in residual effects which are 'not significant'.
- 3.9 The IAQM guidance makes it clear that no assessment of the significance of effects without mitigation should be carried out as mitigation measures will be required due to planning conditions as well as best practice for construction companies. The

IAQM guidance also states that the overall residual effect, taking into account the proposed mitigation, will usually be 'not significant'.

Construction Road Traffic Impacts

- 3.10 The potential impacts on existing sensitive human receptors as a result of construction traffic have been qualitatively assessed, taking into consideration the likely volumes of traffic, the anticipated duration of the construction phase and any anticipated mitigation measures that are likely to be applied.
- 3.11 Where it is not possible to screen out significant effects from road sources, detailed modelling may be required.

Operational Road Traffic Impacts

Screening Assessment

- 3.12 The EPUK/IAQM guidance '*Land Use Planning and Development Control: Planning for Air Quality*' (EPUK & IAQM, 2017) includes a list of indicative criteria for where a detailed air quality assessment would be needed. The criteria relating to screening air quality impacts relating to additional traffic are:
- An increase in Light Duty Vehicle (LDV) traffic of >500 Annual Average Daily Traffic (AADT) (or >100 AADT within or adjacent to an AQMA); or
 - An increase in Heavy Duty Vehicle (HDV) traffic of >100 AADT (or >25 AADT within or adjacent to an AQMA).
- 3.13 The above criteria apply to any individual link and therefore, a development generating over 500 AADT (or >100 AADT within an AQMA) may be considered to fall below the screening criteria where the increase is spread over a number of different road links.
- 3.14 Where it is not possible to screen out significant effects from road sources, detailed modelling is then generally required.

Detailed Assessment

- 3.15 Annual mean concentrations of NO₂ and PM₁₀ have been predicted at a range of worst-case existing locations for human health exposure. Concentrations and

changes in concentrations have then been compared against appropriate assessment criteria in order to determine the significance of any effect.

- 3.16 Relevant sensitive locations are those where members of the public will be regularly present over the averaging period of the relevant air quality objective(s). For pollutants of interest in this assessment (i.e. NO₂ and PM₁₀) sensitive locations considered include the façades of a hotel (sensitive to the 1-hour mean NO₂ objective and the 24-hour mean PM₁₀ objective) and a restaurant (sensitive to the 1-hour mean NO₂ objective).
- 3.17 Based on the criteria above, 3 no. existing worst-case receptors have been identified for assessment. The locations of these receptors are shown in **Table 3-1** and **Figure 3-1**.
- 3.18 In addition, concentrations of NO₂ have been modelled at local diffusion tube monitoring site DT27 from the neighbouring SNDC for use in model verification. Further details of model verification are provided in **Appendix C**.

Table 3-1: Modelled Receptor Locations

Receptor	Description	Coordinates		Height (m)	Approx. No. properties represented
		X	Y		
R1	Façade of hotel fronting onto Barnard Road	617760	309906	1.5 ^a	1
R2	Façade of hotel fronting onto Barnard Road	617810	309942	1.5 ^a	1
R3	Façade of restaurant fronting onto Barnard Road	617849	309865	1.5 ^a	1

^a Receptor has been modelled at 1.5 m which is considered to be representative of ground floor level exposure for adults (i.e. breathing height).

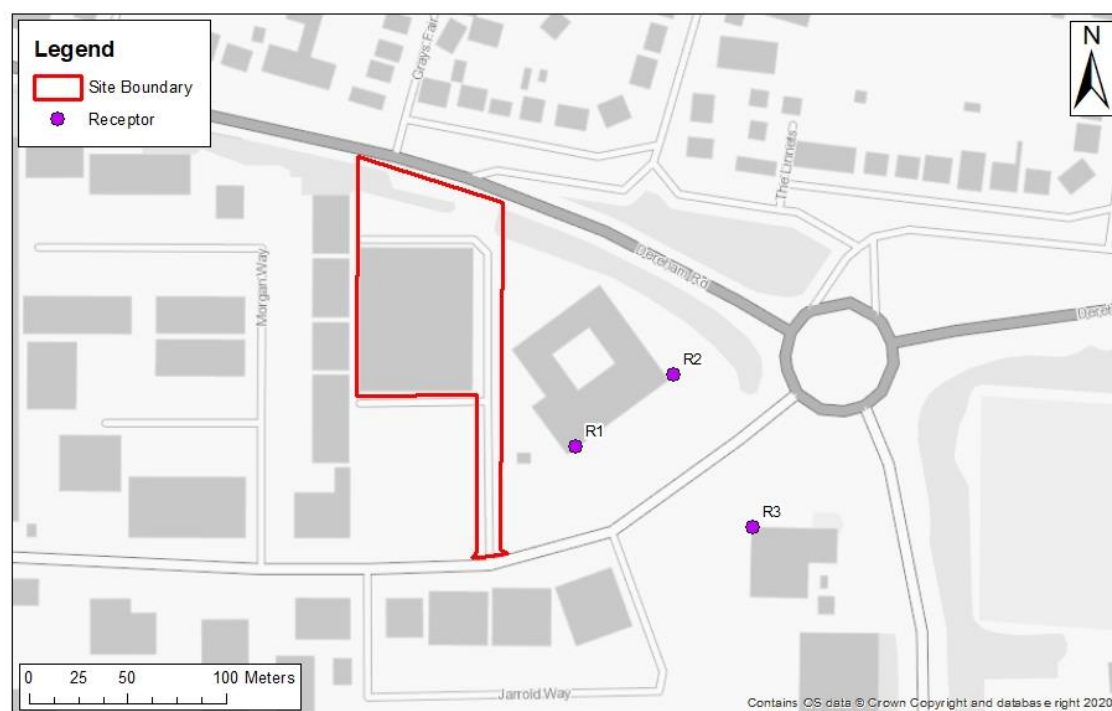


Figure 3-1: Existing Receptor Locations

- 3.19 Concentrations of NO₂ and PM₁₀ at the identified receptors have been modelled using the ADMS-Roads dispersion model (v5.0.1). This model requires a number of inputs including traffic flow (in AADT format), composition (i.e. proportion of HDVs) and average speed data, as well as road characteristics such as width, gradient and street canyon dimensions, as applicable.
- 3.20 Traffic flow and composition data have been obtained from the project's transport consultant (Focus Transport). Where necessary, data has been adjusted to represent later years utilising Trip End Model Presentation Program (TEMPro) growth factors, as provided by the project's transport consultant (Focus Transport). A summary of the traffic data and the assumptions used in this assessment are provided in **Appendix E**.
- 3.21 The emissions associated with the traffic have been calculated using the Emissions Factor Toolkit (EFT) v12.0 (Defra, 2023). This utilises emissions factors taken from the European Monitoring and Evaluation Programme (EMEP) / European Environment Agency (EEA) Air Pollution Emission Inventory Guidebook 2019 (EMEP / EEA, 2019) which is consistent with the COPERT 5.6 emission calculation tool (EMISIA, 2019), fleet composition data collected as part of the National Atmospheric Emissions Inventory (NAEI) and by Transport for London (TfL), along

with data relating to the fleet and vehicle turnover in the UK. Traffic data have been entered into the EFT to provide emissions rates for each of the road links modelled for the 'current'³ and future⁴ years, along with road type, vehicle fleet composition and speed. Whilst nitrogen oxides (NO_x) emissions rates are related to exhaust only, emissions rates for PM₁₀ also include increments for road, tyre and break wear.

- 3.22 Whilst it is acknowledged that a later version of the EFT (v12.0.1) was released after the modelling was undertaken for this assessment, analysis conducted by ACE demonstrates that the use of the updated EFT would not alter the outcome of the assessment.
- 3.23 The model also requires meteorological data and inputs. The model has been run utilising 2022 data from the Norwich Airport meteorological station which is considered suitable for the study area. **Appendix C** provides additional information on the meteorological inputs.

Assumptions and Limitations

- 3.24 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent on the traffic data that have been input which will have inherent uncertainties associated with them. There is then the uncertainty as the model is required to simplify real-world conditions into a series of algorithms.
- 3.25 The model relies on meteorological data for 2022 which may not represent conditions in the future, particularly when taking into consideration additional uncertainties introduced as a result of climate change.
- 3.26 Emissions in the UK are generally expected to reduce over time, however, the impacts of the proposed development have been assessed using emissions predicted for 2023 (i.e. it is assumed that there will be no future improvements in the vehicle fleet). Since traffic in the UK is generally expected to increase over time, in order to take a worst-case approach, traffic data relating to 2028 (i.e. when the proposed development is anticipated to be fully operational) has been applied. These combined worst-case assumptions will contribute to a very conservative assessment.

- 3.27 It should be noted that some of the data used in this assessment (e.g. the background concentrations) are based on assumptions which were current before the occurrence of the Covid-19 pandemic. As such, these data will not reflect any changes that have occurred or may occur in the future as a result of behavioural change caused by the pandemic and / or as a result of measures implemented by governing authorities (e.g. lockdowns, travel restrictions etc.).

Air Quality Impacts Significance Criteria

- 3.28 In the absence of official guidance in the UK on how to assess the significance of the air quality impacts of a new development, the approach developed by the and EPUK and IAQM (EPUK & IAQM, 2017) has been followed in this assessment. This approach considers the predicted change in air quality, as a result of the development, on existing receptors, taking into account the absolute concentrations in comparison to the objectives (set out in **Table 2-1**). This guidance sets out three stages of assessment:

- 1) Determine the magnitude of change at each receptor as a percentage of the objective / Limit Value;
- 2) Describe the impact at each receptor, taking into account the sensitivity of the receptor to changes in concentration (based on the average concentration in the assessment year); and
- 3) Assess the overall significance.

- 3.29 The first two steps are set out **Table 3-2**.

Table 3-2: Impact Descriptors for Individual Receptors ^a

Concentration ^b	% Change ^c			
	1 ^d	2-5	6-10	>10
≤75% ^e	Negligible	Negligible	Slight	Moderate
>75% - ≤95% ^f	Negligible	Slight	Moderate	Moderate
>95%-≤102% ^g	Slight	Moderate	Moderate	Substantial
>102%-<110% ^h	Moderate	Moderate	Substantial	Substantial
≥110% ⁱ	Moderate	Substantial	Substantial	Substantial

^a Where concentrations increase, the impact is described as adverse and where it decreases, it is described as beneficial.

^b Long term average concentration at receptor in assessment year

^c In relation to Objective / Limit Value

^d % change rounded to nearest whole number. Where the change is 0 (i.e. <0.5) the impact will be Negligible.

^e NO₂ or PM₁₀ annual mean ≤30 µg/m³; PM_{2.5} annual mean ≤18.75 µg/m³; PM₁₀ daily mean ≤24 µg/m³ annual mean

^f NO₂ or PM₁₀ annual mean >30-≤38 µg/m³; PM_{2.5} annual mean >18.75-≤23.75 µg/m³; PM₁₀ daily mean >24-≤30.4 µg/m³ annual mean

^g NO₂ or PM₁₀ annual mean >38-≤40.8 µg/m³; PM_{2.5} annual mean >23.75-≤25.5 µg/m³; PM₁₀ daily mean >30.4-≤32.64 µg/m³ annual mean

^h NO₂ or PM₁₀ annual mean >40.8-≤44 µg/m³; PM_{2.5} annual mean >25.5-≤27.5 µg/m³; PM₁₀ daily mean >32.64-≤35.2 µg/m³ annual mean

ⁱ NO₂ or PM₁₀ annual mean >44 µg/m³; PM_{2.5} annual mean >27.5 µg/m³; PM₁₀ daily mean >35.2 µg/m³ annual mean

3.30 The assessment of overall significance (step 3) is made based on professional judgement, taking into account factors such as:

- The number of properties affected by different levels of impacts;
- The magnitude of any changes and descriptors (as identified in stages 1 and 2);
- Whether a new exceedance of an objective or limit value is predicted to arise or an existing exceedance is removed, or an existing exceedance is substantially increased or reduced;
- The level of uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent of any exceedance of an objective or limit value.

3.31 When considered at individual receptors, moderate or substantial impacts at individual receptors may be considered significant, and negligible or slight impacts not significant. Consideration of the overall effect on air quality needs to incorporate consideration of impacts as a whole including the extent to which

receptors represent sensitive locations and whether this wider impact is significant or not.

Site Suitability

- 3.32 The potential for exceedances of the relevant objective (i.e. the 1-hour mean NO₂ objective) at sensitive locations within the proposed development has been screened qualitatively, taking into consideration the location of the Site in relation to nearby emission sources (e.g. local roads), meteorological conditions and baseline air quality conditions within the Site and in the surrounding area.
- 3.33 Where it is not possible to screen out the potential for significant effects, more detailed consideration is then generally required.

Air Quality Impacts Significance Criteria

- 3.34 In the absence of official guidance in the UK on how to assess the significance of the air quality impacts on a new development, this assessment has been limited to a comparison of predicted pollutant concentrations within the Site against the relevant objectives (see **Table 2-1** and **Table 2-2**).

4.0 BASELINE CONDITIONS

Site Context and Study Area

- 4.1 The Site is located in urban surroundings and is bound to the north by Derham Road (A1074), the east by the 'Brook' hotel, to the south by car parking and Barnard Road, and the west by commercial properties along Morgan Way.
- 4.2 The study area in relation to air quality has been defined as:
- For the construction dust risk assessment, the study area is the area up to 250 m from the Site boundary and up to 50 m of the route(s) used by construction vehicles on the public highway (up to 250 m from the Site exit(s));
 - For the assessment of the effect of traffic generated by the proposed development on human health, the study area incorporates all main roads (and adjacent sensitive human receptors) along which such traffic may travel; and
 - For the assessment of Site suitability, the study area has been identified as the area within the boundary of the Site and sources which will influence this area.

EU Limit Values

- 4.3 There are no AURN monitoring sites or PCM model predictions located in close proximity to the Site and, therefore, no exceedances of the EU Limit Values have been measured or predicted nearby.

LAQM

- 4.4 NCC and the neighbouring SNDC has assessed air quality within its area as part of its responsibilities under LAQM.
- 4.5 NCC currently has one declared AQMA; 'Central Norwich AQMA'. 'Central Norwich AQMA' was declared in November 2021 as a result of exceedances of the annual mean NO₂ objective and is located approximately 4.8 km to the southeast of the Site.

- 4.6 SNDC does not currently have any declared AQMAs.

Monitoring

- 4.7 NCC carried out NO₂ monitoring at 45 no. diffusion tube monitoring sites in 2022. Additionally, NCC carried out NO₂ monitoring at two automatic monitoring sites. SNDC undertook NO₂ monitoring at 30 no. diffusion tube monitoring sites but does not currently operate any automatic monitoring.
- 4.8 There are no NCC diffusion tube, or automatic, monitoring sites located within close proximity to the Site; as such monitoring from SNDC only has been considered. The closest locations to the are identified in **Figure 4-1**, and measured concentrations for 2018 to 2022⁵ are shown in **Table 4-1**.
- 4.9 No exceedances have been measured at any of the diffusion tube monitoring locations between 2018 and 2022. Furthermore, measured annual mean NO₂ concentrations are <60 µg/m³ at all monitoring sites considered between 2018 and 2022, indicating that exceedances of the 1-hour mean NO₂ objective are not likely during this time period.
- 4.10 There is a clear overall trend of decreasing measured annual mean NO₂ concentrations at all monitoring sites.

⁵ As a result of the Covid-19 pandemic and associated behavioural changes and measures implemented by the governing authorities (e.g. lockdowns, travel restrictions etc.) measured concentrations during 2020 are not considered to be representative of 'normal' conditions. As such, measured 2020 concentrations are presented for information only, and have not been discussed or given weight in determining the conclusions of this assessment.

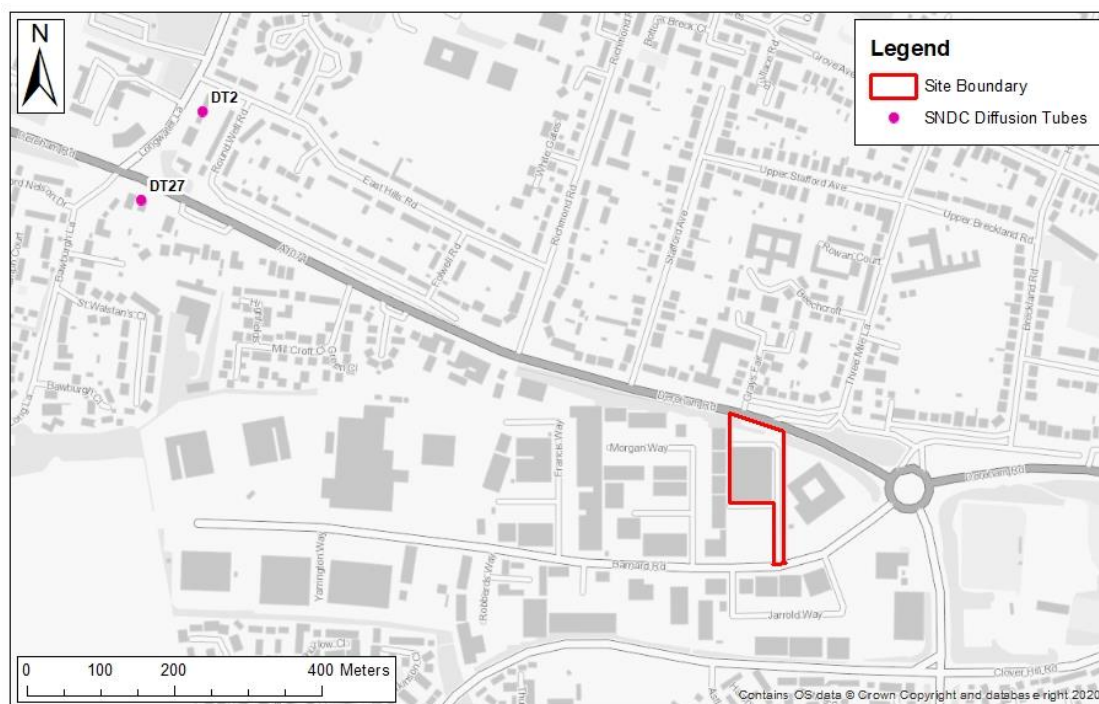


Figure 4-1: Local Monitoring Locations; SNDC

Table 4-1: Measured Annual Mean NO₂ Concentrations (µg/m³)

Site ID	Site Name	Site Type	2018	2019	2020	2021	2022
DT2	2 - 131 Longwater Lane, Costessey	Suburban	20	19	14	15	15
DT27	27 - The Round Hose, Costessey	Roadside	24	16	11	13	12
Objective			40				

Exceedances of the annual mean objective are shown in **BOLD**.

Data taken from SNDC's 2022 Air Quality Annual Status Report (ASR) (SNDC, 2023).

Predicted Background Concentrations

- 4.11 Predicted annual mean background concentrations of NO₂ and PM₁₀ have been obtained from national maps provided by Defra (Defra, 2020b).
- 4.12 The predicted background NO₂ and PM₁₀ concentrations are all well below the relevant objectives within the Site and at the identified existing receptors in both the 'current'³ and future⁴ years.

**Table 4-2: Predicted Annual Mean Background Concentrations
(µg/m³)**

Year	Location	NO ₂	PM ₁₀
2022	Site ^a and Receptors R1 – R3	12	15
2023	Site ^a and Receptors R1 – R3	12	14
Objectives ^a		60	32

^a As the Site covers 2 x Defra background 1 x 1 km squares, the square with the highest predicted concentration has been assumed as this is a worst-case approach.

^b Proxy objectives have been used to consider the 1-hour mean NO₂ and 24-hour mean PM₁₀ objectives using predicted annual mean concentrations.

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source as well as the relevant objectives.

Predicted Baseline Concentrations

- 4.13 The ADMS-Roads model has been used to predict baseline annual mean NO₂ and PM₁₀ concentrations at the relevant existing receptor locations identified in **Table 3-1** and **Figure 3-1** for both the 'current'³ and future⁴ baseline scenarios. The predicted concentrations are shown in **Table 4-3**.
- 4.14 Predicted annual mean concentrations of NO₂ and PM₁₀ are well below 60 µg/m³ and 32 µg/m³ respectively at all applicable receptors in both 2022 and 2023, indicating that exceedances of the short-term NO₂ and PM₁₀ objectives during this time period are not likely.

Table 4-3: Predicted Annual Mean Baseline Concentrations (µg/m³)

Receptor	NO ₂		PM ₁₀	
	2021	2023	2021	2023
R1	13	13	15	15
R2	14	14	15	15
R3	14	13	n/a	n/a
Objectives ^a	60		32	

^a Proxy objectives have been used to consider the 1-hour mean NO₂ and 24-hour mean PM₁₀ objectives using predicted annual mean concentrations.

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources as well as the relevant objectives.

5.0 PREDICTED IMPACTS

Construction Dust Impacts

Screening Assessment

- 5.1 The primary potential effects during the construction phase relate to annoyance and loss of amenity caused by dust soiling, health impacts relating to PM₁₀ and ecological impacts due to dust deposition. Based on the screening criteria set out by the IAQM, it is considered necessary to carry out a construction dust risk assessment as there are sensitive human receptors located within 250 m of the Site boundary and within 50 m of the roads along which dust may be tracked out by construction vehicles.
- 5.2 There are no designated ecological sites located within 50 m of the Site boundary or roads along which dust may be tracked. Therefore, the assessment of dust deposition on ecological sites has not been considered further as part of this construction dust risk assessment.

Further Assessment

Dust Emission Magnitude

- 5.3 The dust emission magnitude relating to demolition, earthworks and construction activities and as a result of trackout have been determined based on the IAQM guidance (as set out in **Appendix B**).
- 5.4 The proposal includes the demolition of existing buildings with an estimated total volume of between 12,000 and 75,000 m³. The dust emission magnitude associated with demolition activities is therefore considered to be 'medium'.
- 5.5 Proposed earthworks activities could extend up to approximately 9,000 m² (the approximate area of the Site). The soil composition at the Site is deep with a predominantly sand to sandy loam and clayey texture, with areas of a loam to clayey loam, locally chalk texture (UK Soil Observatory, 2023). The subsoil is predominantly glaciofluvial deposits, with areas of glacial till (UK Soil Observatory,

2023). Subsoil grains are predominantly arenaceous⁶ – rudaceous⁷ in size, with areas of mixed (argillic⁸ to arenaceous) (UK Soil Observatory, 2023). As such the soil composition is considered to have the potential to be moderately dusty. Based on the above, the dust emission magnitude associated with the earthwork activities is considered to be 'small'.

- 5.6 The proposed development will involve the construction of a food store, with the total building volume estimated to be 12,000 m³. The dust emission magnitude associated with construction activities is therefore considered to be 'small'.
- 5.7 The peak number of HDV movements exiting the Site which may track material onto roads is unknown, and so has been estimated to be <20 based on the size of the proposed development. The dust emission magnitude associated with trackout activities is therefore considered to be 'small'.

Area Sensitivity

- 5.8 The sensitivity of the area to dust soiling and human health impacts has been assessed based on the criteria shown in **Appendix B**.
- 5.9 Commercial properties are considered to be of 'medium' sensitivity to dust soiling impacts. There are several commercial properties (including a hotel) located within 20 m of the Site. The sensitivity of the area surrounding the Site to dust soiling impacts is therefore considered to be 'medium'.
- 5.10 The guidance states that trackout can occur on roads up to 50 m from 'small' sized sites (i.e. the Site). Construction vehicle routing is unknown, and so has been assumed to travel 50 m both east and west of the Site. There are estimated to be several commercial properties located within 20 m of roads which may be subject to trackout. The sensitivity to dust soiling impacts relating to trackout is therefore considered to be 'medium'.
- 5.11 Commercial properties are also considered to be of 'medium' sensitivity in terms of human health impacts. For the purposes of the construction dust risk

⁶ Typical particle size of 0.06 – 2.0 mm.

⁷ Typical particle size of >2.0 mm.

⁸ Typical particle size of <0.06 mm.

assessment, taking into consideration the low predicted background and modelled baseline concentrations of PM₁₀ within the study area (see **Table 4-2** and **Table 4-3**), it is assumed that baseline annual mean PM₁₀ concentrations in the surrounding area will be <24 µg/m³. Taking into account the assumed baseline PM₁₀ concentrations and the number of sensitive properties located in close proximity of the Site boundary (see Paragraph 5.9) and roads where trackout may occur (see in Paragraph 5.10), the sensitivity of the surrounding area to human health impacts is therefore considered to be 'low' both the area surrounding the Site and the area surrounding roads along which dust may be tracked.

Risk of Impacts

- 5.12 The risk of construction dust impacts, without mitigation, has been assessed based on the tables provided in **Appendix B** and the identified risks are shown in **Table 5-1**.

Table 5-1: Risk of Construction Dust Impacts Without Mitigation

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Low	Low	Negligible
Human Health	Low	Negligible	Negligible	Negligible

- 5.13 Overall, taking into consideration the risks set out in **Table 5-1**, appropriate mitigation measures corresponding to a 'medium' risk site are required, although where measures relate to earthworks and construction activities only measures corresponding to a 'low' risk site will be sufficient, and no measures are required to address trackout. The recommended list of mitigation measures is set out in **Section 6.0**.
- 5.14 The IAQM recommends that no judgement of the significance of construction dust effects should be made without taking mitigation into account. This is due to the fact that mitigation measures are assumed to be secured by planning conditions and legal requirements as well as construction codes of conduct. Following implementation of the recommended mitigation (as set out in **Section 6.0**), residual effects will be 'not significant'.

Construction Road Traffic Impacts

- 5.15 Construction traffic generation is not currently known; however, it is reasonable to assume that volumes of construction traffic will be less than volumes of operational traffic based on the nature of the proposed development. As such, impacts associated with construction traffic are anticipated to be less than impacts associated with operational traffic (see Paragraph 5.24).
- 5.16 Additionally, it should also be taken into consideration that any impacts associated with the construction phase will be temporary in nature. Furthermore, it is anticipated that a Construction Environmental Management Plan (CEMP) will be developed and will include measures to minimise emissions associated with construction vehicles, thus further reducing any potential impacts.
- 5.17 On the basis of the above, it is likely that the overall effect of construction traffic on nearby existing sensitive human receptors is likely to be 'not significant'.

Operational Road Traffic Impacts

Screening Assessment

- 5.18 The proposed development is anticipated to generate traffic which will result in an increase of more than 500 AADT (i.e. above the EPUK / IAQM screening criteria for outside an AQMA, see Paragraphs 3.12 and 3.13) along stretches of Barnard Road⁹.
- 5.19 As such, it is not possible to screen out impacts on these stretches of road based on the EPUK/IAQM screening criteria (see Paragraph 3.12 and 3.13) and a detailed assessment has therefore been undertaken.

Detailed Assessment

- 5.20 Annual mean concentrations of NO₂ and PM₁₀ have been predicted at existing receptors in the future⁴ year, both with and without the proposed development in place. The identified receptors are described in **Table 3-1** and shown in **Figure 3-1**. Predicted concentrations, the percentage change relevant

⁹ Based on traffic data provided by the project's transport consultant; Focus Transport.

to the applicable objective and the impact at each receptor are presented in **Table 5-2** and **Table 5-3** for NO₂ and PM₁₀ respectively.

Table 5-2: Predicted Annual Mean Concentrations of NO₂ (µg/m³), % Change and Impact at each Existing Receptor

Receptor	2023 Without Development	2023 With Development	Change (%)	Impact
R1	13	13	0	Negligible
R2	14	14	0	Negligible
R3	13	13	0	Negligible
Objective ^a	60		-	

^a Proxy objective has been used to consider the 1-hour mean NO₂ objective using predicted annual mean concentrations.
 Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources.

Table 5-3: Predicted Annual Mean Concentrations of PM₁₀ (µg/m³), % Change and Impact at each Existing Receptor

Receptor	2023 Without Development	2023 With Development	Change (%)	Impact
R1	15	15	0	Negligible
R2	15	15	0	Negligible
Objective ^a	40		-	

^a Proxy objective has been used to consider the 24-hour mean PM₁₀ objective using predicted annual mean concentrations.
 Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the model and data sources.

- 5.21 Predicted annual mean concentrations of NO₂ and PM₁₀ are below 60 µg/m³ and 32 µg/m³ respectively, indicating that exceedances of the short-term objectives for NO₂ and PM₁₀ are not likely, either with or without the proposed development.
- 5.22 The predicted changes in NO₂ and PM₁₀ concentrations (when rounded to the nearest whole number) are 0% at all receptors. Using the criteria set out in **Table 3-2**, these impacts are described as being 'negligible' at all receptors.
- 5.23 The overall effect on existing receptors has been considered, taking into account the following factors:
- The impacts at individual modelled receptors;
 - The number of properties represented by each modelled receptor;

- The assumptions and limitations of the model, including any conservative / worst-case assumptions;
- The predicted concentrations and how close these are to the relevant objectives; and
- The potential for any change to impact on an existing AQMA and / or to result in the declaration or extension of an AQMA.

5.24 Based on the above, the overall effect of operational traffic generated by the proposed development on local air quality is considered to be 'not significant'.

Site Suitability

- 5.25 The proposed development is to introduce new areas sensitive to the 1-hour mean only (the proposed food store).
- 5.26 The nearest emission sources to the Site are Dereham Road (A1074) and Barnard Road. Dereham Road (A1074) is likely to be a significant emissions source, however, the Site is well set back from this road by approximately 20m and is partially shielded by a row of vegetation. Furthermore, the Site is located upwind of this source (based on the prevailing winds in the local area, see Figure C.1 in Appendix C). The Site is located in closer proximity to Barnard Road, however, this road is more minor and, therefore, likely to be a comparatively lesser emissions source.
- 5.27 Local NO₂ diffusion tube monitoring site DT27 is set back from the kerb of Dereham Road by a similar amount to the Site (approximately 18 m) and is, therefore, considered to be suitably representative of likely conditions within the Site. Site DT27 measured 12.4 µg/m³ in 2022; this is well below 60 µg/m³ (see **Table 4-1**), indicating that exceedances of the 1-hour mean NO₂ objective this distance from Dereham Road (A1074) are not likely. Furthermore, DT27 has consistently measured concentrations well below 60 µg/m³ since 2018 (see **Table 4-1**).
- 5.28 It is also observed that predicted background concentrations of NO₂ within the Site are well below 60 µg/m³ (see **Table 4-2**), as are predicted concentrations at nearby existing receptors located close to the Site (see **Table 5-2**).

- 5.29 As such, on the basis of the above, it is judged that future users of the proposed development will experience good air quality, and that the Site is suitable for its intended end use.

6.0 MITIGATION

Construction Dust

- 6.1 The following standard mitigation measures have been identified as being appropriate for a 'medium' risk site, although for earthworks and construction activities only measures corresponding to a 'low' risk site will be sufficient and no measures are required to address trackout (see **Table 5-1**). This is based on the recommendations within the IAQM's 'Guidance on the assessment of dust from demolition and construction' (IAQM, 2023).
- 6.2 A Dust Management Plan (DMP) should be submitted to NCC prior to works commencing on the Site.

Site Management

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Develop and implement a DMP;
- Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;
- Display the head or regional office contact information;
- Record and respond to all dust and air quality pollutant emission complaints;
- Make the complaints log available to the local authority when asked; and
- Record any exceptional incidents that cause dust and air quality pollutant emissions, either on- or off- site, and the action taken to resolve the situation in the log book.

Monitoring

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include

regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary; and

- Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
- Carry out regular site inspections to monitor compliance with air quality and dust control procedures, record inspection results, and make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by those accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;
- Remove materials from site as soon as possible; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating vehicle/machinery and sustainable travel

- Ensure all vehicles switch off engines when stationary - no idling vehicles;
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate); and
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Avoid bonfires and burning of waste materials.

Demolition

- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);
- Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- Avoid explosive blasting, using appropriate manual or mechanical alternatives; and
- Bag and remove any biological debris or damp down such material before demolition.

Construction

- Avoid scabbling (roughening of concrete surfaces) if possible; and
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Road Traffic Impacts; Construction

- 6.3 The overall effects, without mitigation, of construction traffic generated by the proposed development are likely to be 'not significant'. Therefore, no further mitigation measures are considered to be necessary.

Road Traffic Impacts; Operational

- 6.4 The overall effects, without mitigation, of operational traffic generated by the proposed development will be 'not significant'. Therefore, no further mitigation measures are considered to be necessary.

Site Suitability

- 6.5 Future⁴ concentrations of pollutants at sensitive locations within the proposed development are predicted to be well below the relevant objectives. Therefore, air

quality for future users of the proposed development is considered to be good and no mitigation is recommended as being necessary.

7.0 CONCLUSIONS

- 7.1 The potential air quality impacts associated with the proposed food store development at Barnard Road, Norwich in NCC have been assessed and appropriate mitigation recommended.
- 7.2 There is the potential for dust and PM₁₀ impacts during the construction phase. However, with the proposed mitigation measures in place, the overall residual effect will be 'not significant'.
- 7.3 The impacts of construction traffic generation by the proposed development have been assessed. Taking into consideration the likely volume of traffic, the temporary nature of any impacts and the likely implementation of a CEMP, the overall effect is likely to be 'not significant'.
- 7.4 The impacts of operational traffic generation associated with the proposed development on nearby existing sensitive properties have been considered. Modelling of pollutant concentrations has been undertaken at worst-case locations in the local area; the predicted changes in concentrations as a result of operational traffic are 'negligible' at all receptors and do not result in any exceedances of the relevant national air quality objectives. As such, the overall effect of operational traffic on these nearby existing sensitive human receptors will be 'not significant'.
- 7.5 The impact of pollutant concentrations within the Site on future users of the proposed development has been qualitatively assessed. Taking into consideration the proximity of the Site to local emissions sources, meteorological conditions and baseline air quality it is judged that new users of the proposed development will experience good air quality and the Site is therefore suitable for its intended end-use.

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Appendix A Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ACE	Ardent Consulting Engineers
ADMS	Air Dispersion Modelling System
AQA	Air Quality Assessment
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
ASHP	Air-Source Heat Pump
ASR	Annual Status Report
AURN	Automatic Urban and Rural Network
BDC	Broadland District Council
BST	British Summer Time
CAZ	Clean Air Zone
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO ₂ in the air
DMP	Dust Management Plan
EC	European Commission
EEA	European Environment Agency
EEC	European Economic Community
EFT	Emission Factor Toolkit
EMEP	European Monitoring and Evaluation Program
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NCC	Norwich City Council
NCoC	Norfolk County Council
LDV	Light Duty Vehicle; a vehicle with a gross vehicle weight equal to or less than 3.5 tonnes, includes Light Goods Vehicles, cars and motorbikes
LGV	Light Goods Vehicle
NAEI	National Atmospheric Emissions Inventory
NAQO	National Air Quality Objective as set out in Air Quality Strategy and the Air Quality Regulations
NCC	Norwich City Council
NO	Nitric Oxide
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides, generally considered to be nitric oxide and NO ₂ . The main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles and natural gas used in gas-fired boilers.
NPPF	National Planning Policy Framework
NRMM	Non-road mobile machinery
PCM	Pollution Climate Mapping

Abbreviations	Meaning
PM ₁₀ or PM _{2.5}	Small airborne particles less than 10/2.5 µg in diameter
PPG	Planning Practice Guidance
PV	Solar Photovoltaic
Receptor	A location where the effects of pollution may occur
SNC	South Norfolk Council
TEMPro	Trip End Model Presentation Programme
TfL	Transport for London
ULEV	Ultra-Low Emission Vehicle

Appendix B IAQM Dust Assessment Approach

B1.1 Step 1 is the screen the need for an assessment against the following criteria:

- 'Human receptor' within:
 - 250 m (50 m in London) of the boundary of the site; or
 - 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).
- 'Ecological receptor' within:
 - 50 m of the boundary of the site; or
 - 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s).

B1.2 Where there are no sensitive receptors within these distances, it can be concluded that the impact is negligible and no further assessment relating to construction dust impacts is required.

B2 Step 2: Assess the risk of dust impacts

B2.1 The risk of dust at sufficient quantum to cause annoyance/health/ecological impacts should be based on:

- The scale and nature of the works (potential dust emission magnitude) (**Table B.1**); and
- The sensitivity of the area to dust impacts based on the matrices shown in **Table B.2**, **Table B.3** and
- **Table B.4**.

B2.2 These factors are then combined to determine the risk of dust impacts without mitigation applied for each of the four activities (Demolition, Earthworks, Construction and Trackout) following the matrices shown in **Table C.5**, **Table C.6** and **Table C.7**.

Table B.1: Potential Dust Emission Magnitude

Size	Definition
Demolition	
Small	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months.
Medium	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material, demolition activities 6-12 m above ground level.
Large	Total building volume >75,000 m ³ , potentially dusty construction material (e.g. Concrete), on-site crushing and screening, demolition activities >12 m above ground level.
Earthworks	
Small	Total site area <18,000 m ² , soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height.
Medium	Total site area 18,500 m ² – 110,000 m ² , moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3 m – 6 m in height.
Large	Total site area >110,000 m ² , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6 m in height.
Construction	
Small	Total building volume <12,000 m ³ , construction material with low potential for dust release (e.g. metal cladding or timber).
Medium	Total building volume 12,000 m ³ – 75,000 m ³ , potentially dusty construction material (e.g. concrete), on site concrete batching.
Large	Total building volume >75,000 m ³ , on site concrete batching, sandblasting.
Trackout	
Small	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.
Medium	20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m.
Large	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.

Table B.2: Sensitivity of the Area to Dust Soiling Effects on People and Property

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

Table B.3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m ³ ^a	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		<10	High	Medium	Low	Low	Low
	28-32 µg/m ³ ^b	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		<10	High	Medium	Low	Low	Low
	24-28 µg/m ³ ^c	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		<10	Medium	Low	Low	Low	Low
	<24 µg/m ³ ^d	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		<10	Low	Low	Low	Low	Low
Medium	>32 µg/m ³ ^a	>100	High	Medium	Low	Low	Low
		10-100	Medium	Low	Low	Low	Low
		<10	Medium	Low	Low	Low	Low
	28-32 µg/m ³ ^b	>100	Low	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		<10	Low	Low	Low	Low	Low
	24-28 µg/m ³ ^c	>100	Low	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		<10	Low	Low	Low	Low	Low
	<24 µg/m ³ ^d	>100	Low	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		<10	Low	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low	Low

^a >18µg/m³ in Scotland^b 16-18 µg/m³ in Scotland^c 14-16 µg/m³ in Scotland^d <14 µg/m³ in Scotland

Table B.4: Sensitivity of the Area to Ecological Impacts

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

Table B.5: Risk of Impacts – Demolition

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

Table B.6: Risk of Impacts – Earthworks and Construction

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

Table B.7: Risk of Impacts – Trackout

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

B3 Step 3: Site-specific Mitigation

B3.1 Based on the outcome of Step 2, appropriate mitigation measures are recommended. The guidance includes a list of mitigation measures for Low,

Medium and High Risk sites but final recommendations should be based on professional judgement and take into account particular site sensitivities and differences in risk for different activities or areas of the site. The mitigation recommended in the guidance are shown in **Table B.8**.

Table B.8: Mitigation Measures (H = Highly Recommended, D = Desirable and N = Not Recommended)

Mitigation Measure	Low Risk	Medium Risk	High Risk
Communications			
1. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	N	H	H
2. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H	H	H
3. Display the head or regional office contact information	H	H	H
Dust Management			
4. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM ₁₀ continuous monitoring and/or visual inspections.	D	H	H
Site Management			
5. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H	H	H
6. Make the complaints log available to the local authority when asked.	H	H	H
7. Record any exceptional incidents that cause dust and/or air emissions, either on- or off- site, and the action taken to resolve the situation in the log book.	H	H	H
8. Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.	N	N	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
Monitoring			
9. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.	D	D	H
10. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked	H	H	H
11. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H	H	H
12. Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	H	H	H
Preparing and maintaining the site			
13. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H	H	H
14. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	H	H	H
15. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period	D	H	H
16. Avoid site runoff of water or mud.	H	H	H
17. Keep site fencing, barriers and scaffolding clean using wet methods.	D	H	H
18. Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	D	H	H
19. Cover, seed or fence stockpiles to prevent wind whipping.	D	H	H
Operating vehicle/machinery and sustainable travel			
20. Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable	H	H	H
21. Ensure all vehicles switch off engines when stationary - no idling vehicles.	H	H	H
22. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H	H	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
23. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)	D	D	H
24. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	N	N	H
25. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing)	N	D	H
Operations			
26. Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	H	H	H
27. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H	H	H
28. Use enclosed chutes and conveyors and covered skips.	H	H	H
29. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H	H	H
30. Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	D	H	H
Waste Management			
31. Avoid bonfires and burning of waste materials.	H	H	H
Demolition			
32. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D	D	H
33. Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H	H	H
34. Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H	H	H
35. Bag and remove any biological debris or damp down such material before demolition.	H	H	H

Mitigation Measure	Low Risk	Medium Risk	High Risk
Earthworks			
36. Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	N	D	H
37. Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable	N	D	H
38. Only remove the cover in small areas during work and not all at once.	N	D	H
Construction			
39. Avoid scabbling (roughening of concrete surfaces) if possible	D	D	H
40. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	D	H	H
41. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	N	D	H
42. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.	N	D	D
Trackout			
43. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	D	H	H
44. Avoid dry sweeping of large areas.	D	H	H
45. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	D	H	H
46. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	N	H	H
47. Record all inspections of haul routes and any subsequent action in a site log book.	D	H	H
48. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	N	H	H
49. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	D	H	H
50. Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	N	H	H
51. Access gates to be located at least 10 m from receptors where possible.	N	H	H

B4 Step 4: Determine Significant Effects

- B4.1 Recommended mitigation measures should be sufficient to ensure that the impact is normally 'not significant'. There may at times be limitations to appropriate mitigation measures (such as lack of water) and therefore, an assessment should always be made based on the characteristic of each site and the surrounding area.

B5 Step 5: Dust Assessment Report

- B5.1 The dust assessment report should include enough detail to ensure that the basis for the determination of emission magnitude and sensitivity of the area, and therefore the site risk, are clear. The required mitigation so also be set out within the report, along with a description of the mechanism that will ensure that the appropriate level of mitigation will be implemented (such as through a planning condition).

Appendix C Model Inputs and Results Processing

C1 Model Inputs and Results Processing Tools

Model Version	ADMS-Roads v5.0.1, January 2022
Street Canyons	The ADMS Advanced Street Canyon Module was used to represent the effect of reduced dispersion and recirculating pollutants in street canyons. The canyons are shown in Appendix E .
British Summer Time (BST)	Adjustment for BST was made within the model, based on the following dates and times: BST begins – 02:00 on 28/03/2022 BST ends – 01:00 on 31/10/2022
Emission Factor Toolkit (EFT)	v12.0, December 2023 (Defra, 2023)
Time Varying Emissions Factors	Based on Department for Transport (DfT) statistics, Table TRA0307: Motor Vehicle Traffic Distributed by Time of Day and Day of the Week on all roads, Great Britain: 2022.
Meteorological Data	2022 hourly meteorological data from Norwich Airport met station has been used in the model. The wind rose is shown in Figure C.1 .
Latitude	52°
Surface Roughness	A value of 0.5 for 'Parkland, open suburbia' was used to represent the modelled area. A value of 0.5 was used to represent Norwich Airport meteorological station site.
Minimum Monin-Obukhov Length	A value of 30 for 'Cities and large towns' was used to represent the modelled area. A value of 30 was used to represent the Norwich Airport meteorological station site.

Surface Albedo	A value of 0.23 (default) was used to represent the modelled area. A value of 0.23 (default) was used to represent the Norwich Airport meteorological station site.
NO _x to NO ₂ Conversion	NO _x to NO ₂ Calculator v8.1 (Defra, 2020c)
Background Maps	2021 reference year background maps (Defra, 2020b)

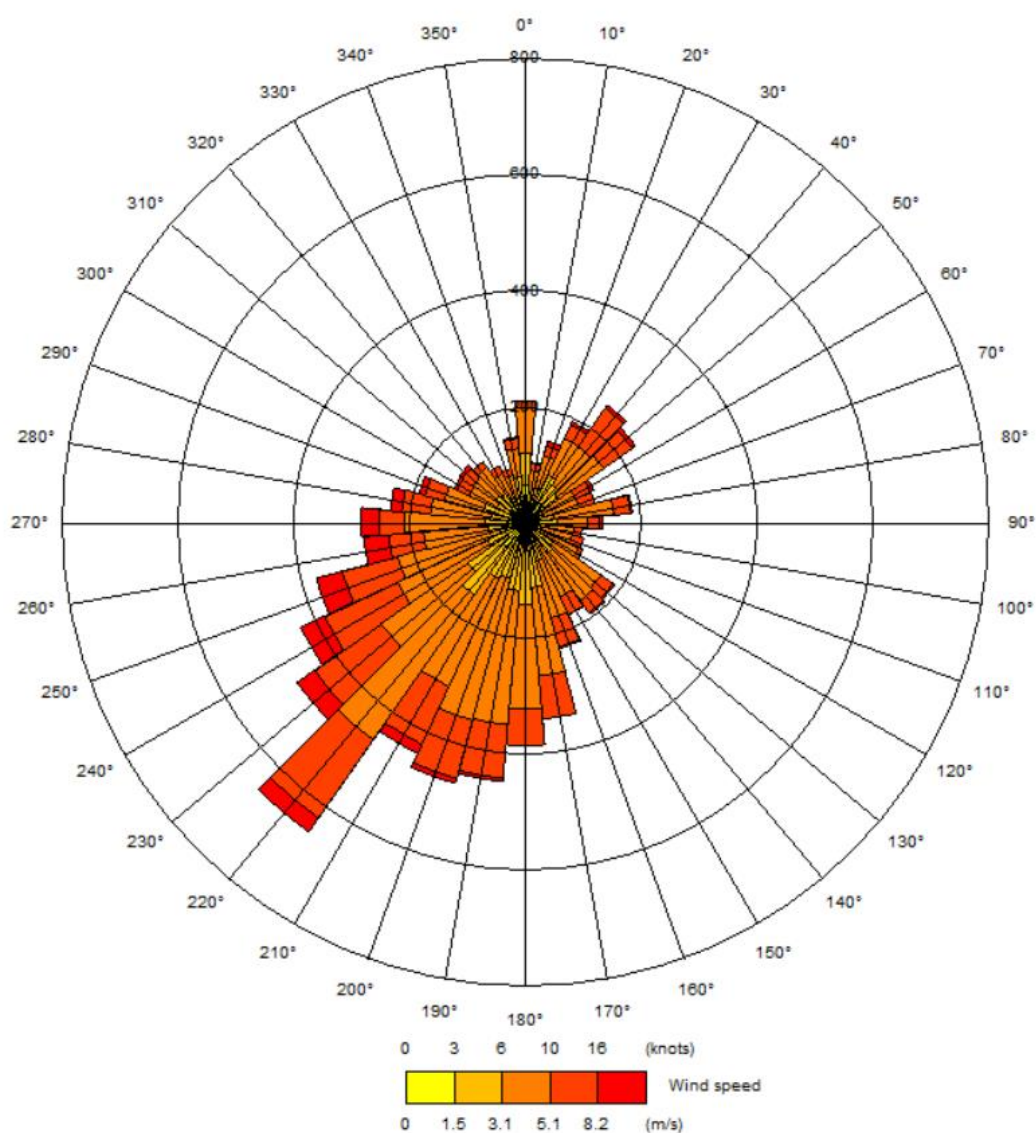


Figure C.1: 2022 Norwich Airport Wind Rose

C2 Verification

Nitrogen Dioxide

- C2.1 Most NO₂ is produced in the atmosphere by a reaction between nitric oxide (NO) and ozone. It is, therefore, most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO₂). The model has been run to predict the annual mean road-NO_x contribution in 2022 at the DT27 diffusion tube monitoring site with SNDC. Concentrations have been modelled at a height of 1.5 m (the height of the monitor).
- C2.2 The choice of appropriate monitoring site for verification has been based on:
- Appropriateness of site (roadside rather than background sites, presence of additional emission sources etc.);
 - Distance from study area;
 - Availability of traffic data for modelling; and
 - Data capture (DT27 measured 100% data capture in 2022).
- C2.3 Annual mean background NO_x and NO₂ concentrations at the DT27 monitoring site used for verification purposes have been predicted as described in Paragraph 4.11 and are presented in **Table C.1** below.

Table C.1: Predicted Annual Mean Background Concentrations (µg/m³)

Monitoring Site	NO_x	NO₂
DT27	15	11

Predicted concentrations are rounded as appropriate taking into consideration the level of accuracy of the data source.

- C2.4 'Measured' road-NO_x was calculated by subtracting calibrated background NO₂ from measured NO₂ within the NO_x from NO₂ calculator. The model output of road-NO_x was then compared with this 'measured' road-NO_x, using the following calculation:

$$\text{DT27 'Measured' road-NO}_x (2.45 \mu\text{g/m}^3) / \text{Modelled road-NO}_x (2.28 \mu\text{g/m}^3) = \text{NO}_x \text{ verification factor (1.0762}^{10}\text{)}.$$

¹⁰ Based on unrounded values.

- C2.5 The results imply that overall, the model was slightly under-predicting the road-NO_x contribution. This is a common experience with this and most other models. Overall, the verification factors are considered to be appropriate.

PM₁₀

- C2.6 There are no suitable PM₁₀ monitoring sites located within the study area. Therefore, the adjustment factor calculated for road-NO_x concentrations (see Paragraph C2.4) has been applied to the modelled road-PM₁₀ concentrations.

Appendix E Traffic Data and Road Network

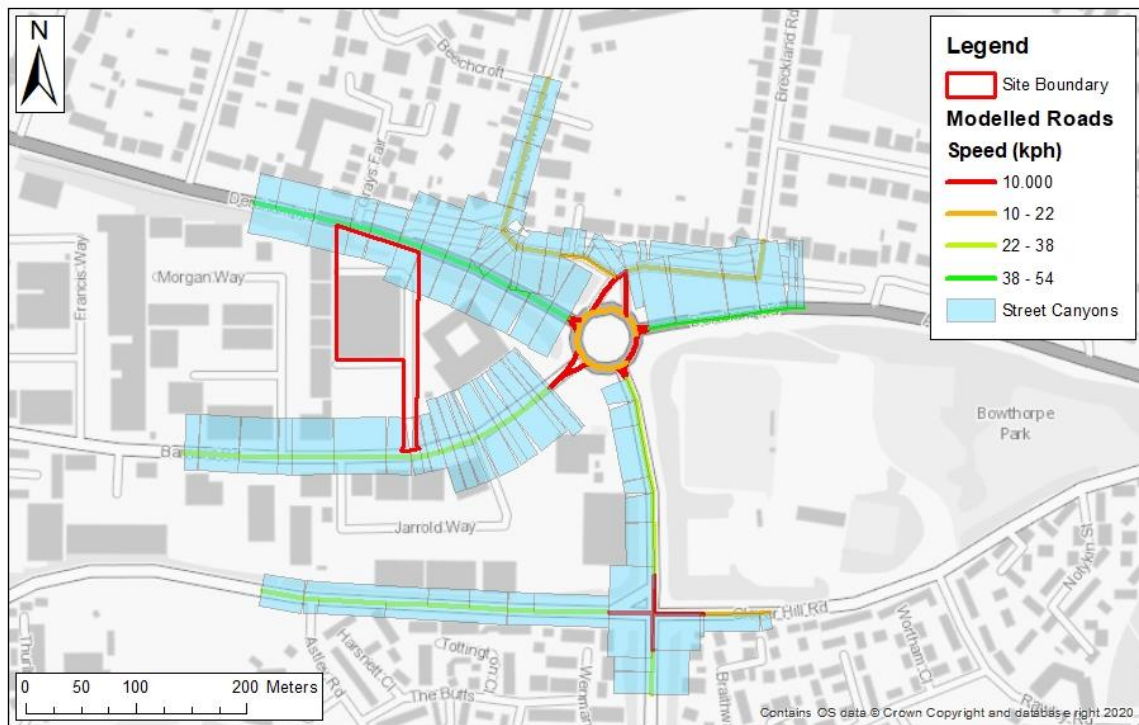


Figure E.1: Modelled Road Network Development Site (inc. Avg. Speeds and Street Canyons)



Figure E.2: Modelled Road Network (inc. Avg. Speeds, Street Canyons and Verification Site)

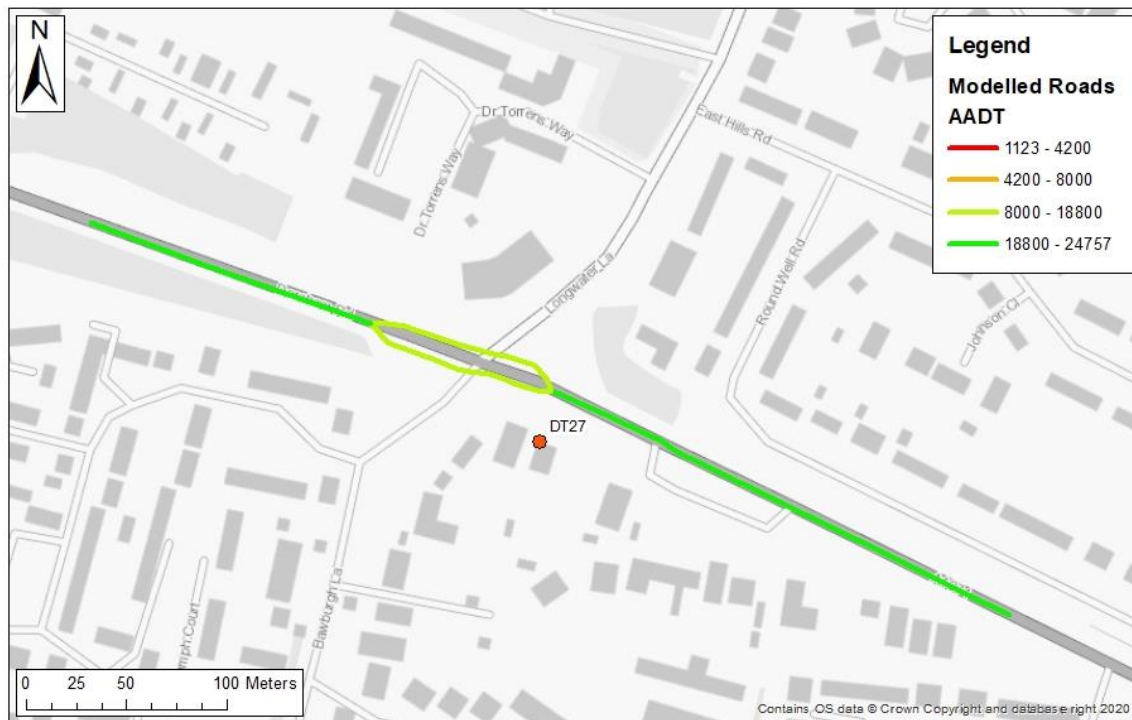


Figure E.3: Modelled Road Network DT27 Verification Site (inc. Baseline AADT)

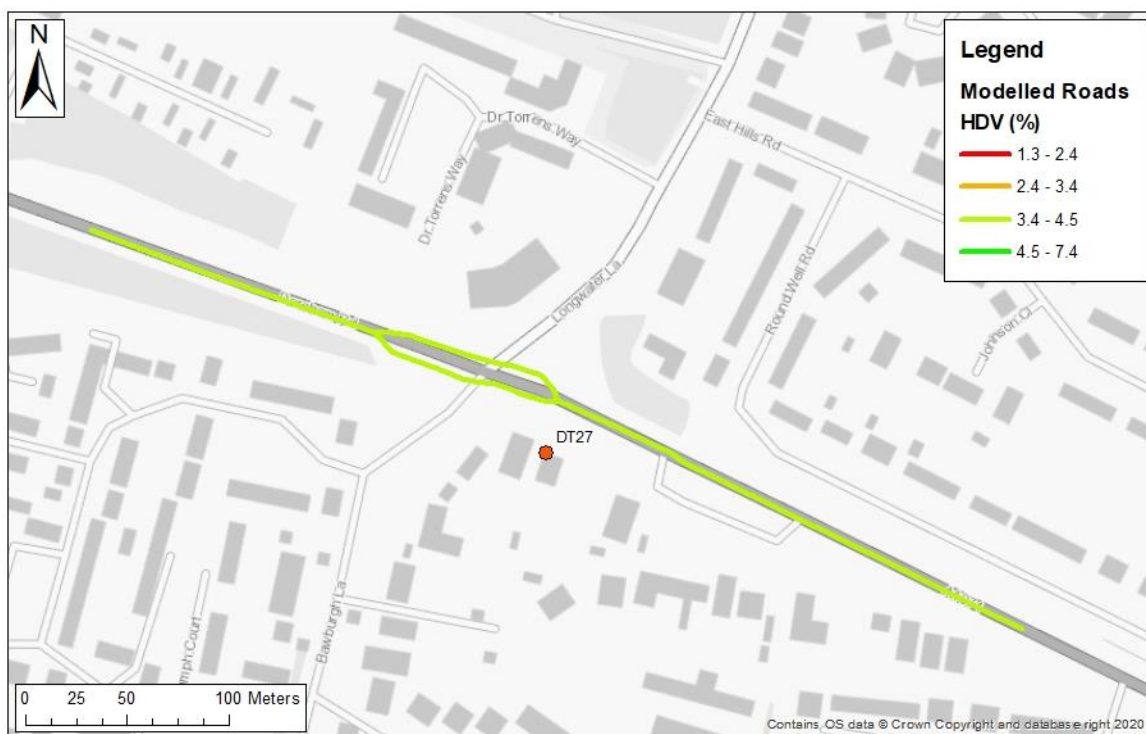


Figure E.4: Modelled Road Network DT27 Verification Site (inc. Baseline %HDV)

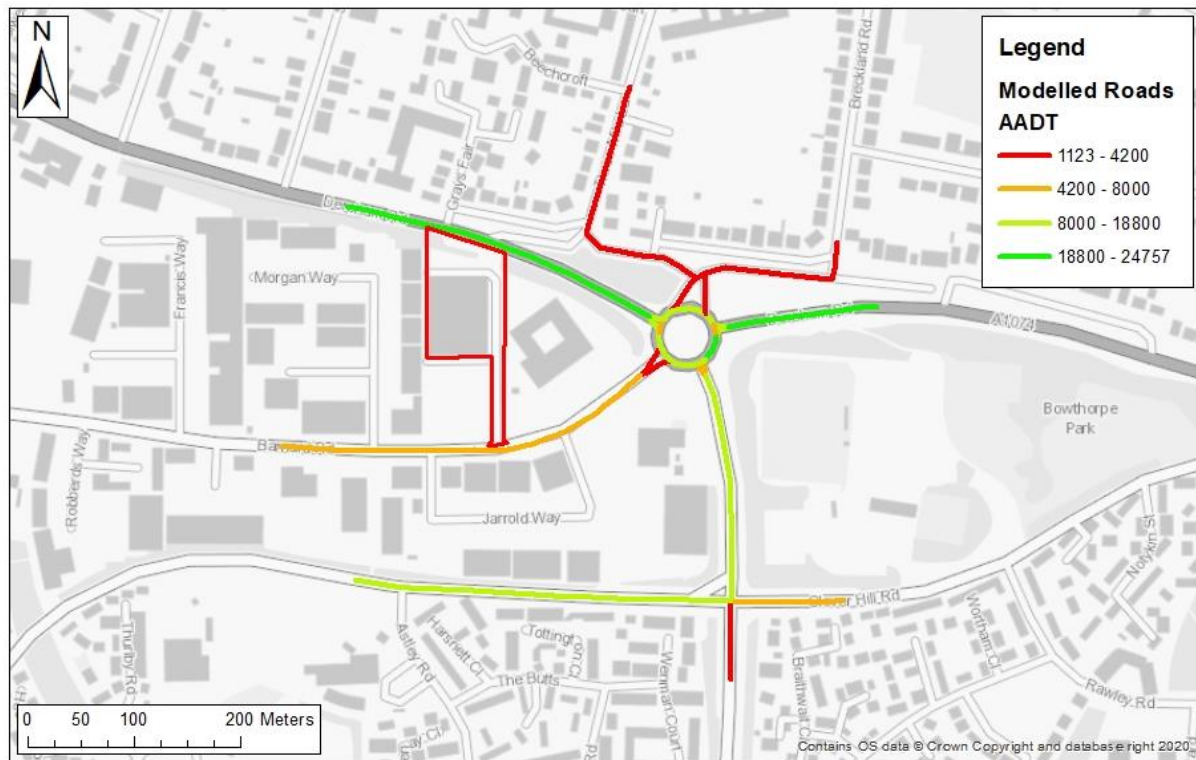


Figure E.5: Traffic Data (Baseline AADT) Development Site

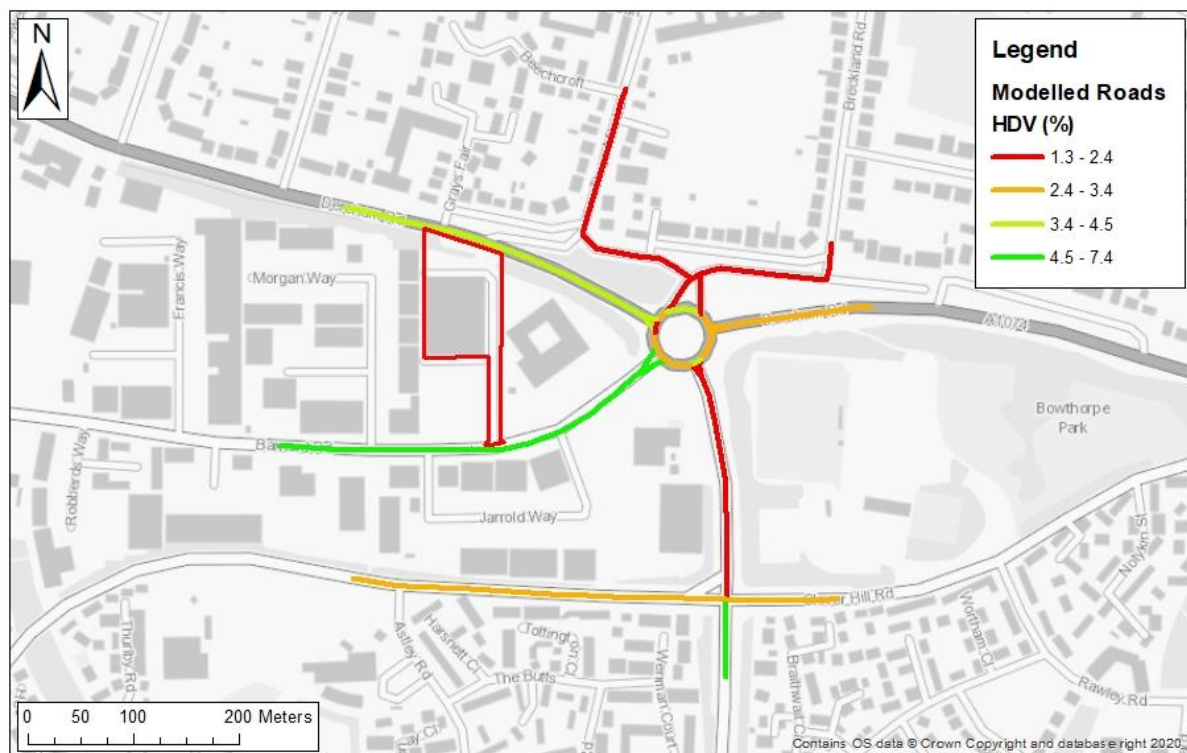


Figure E.6: Traffic Data (Baseline HDV %) Development Site

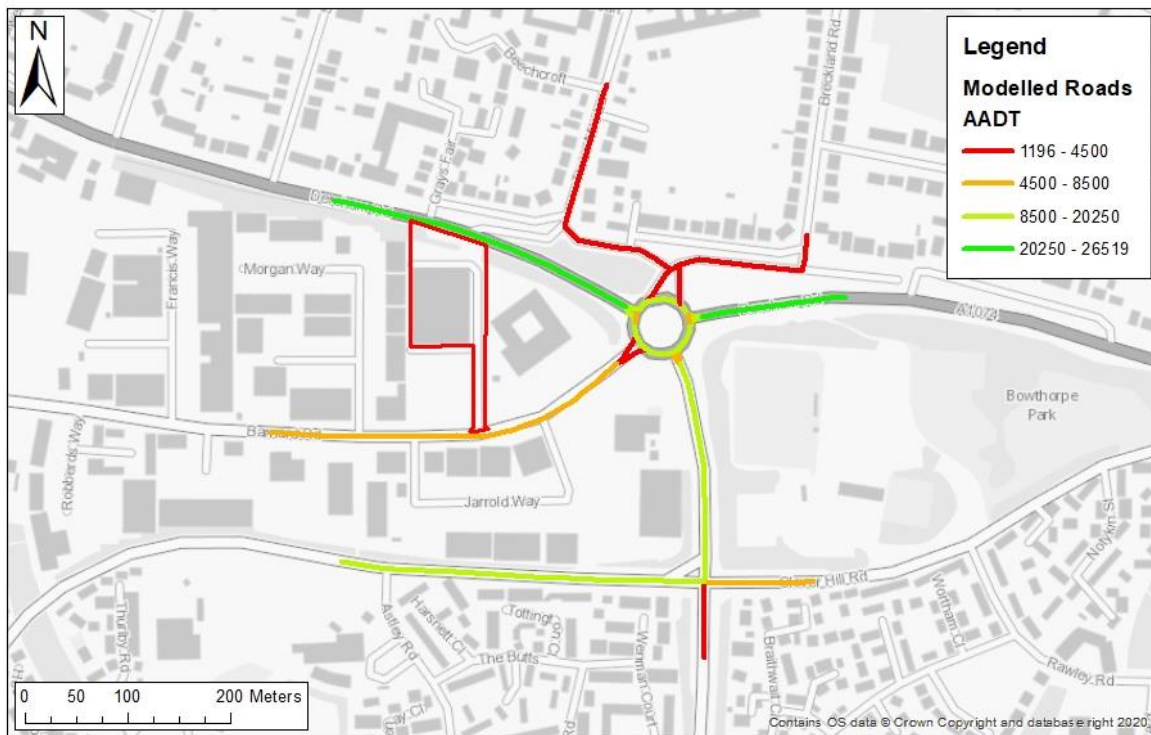


Figure E.7: Traffic Data (Future 'Without Scheme' Scenario AADT)
Development Site

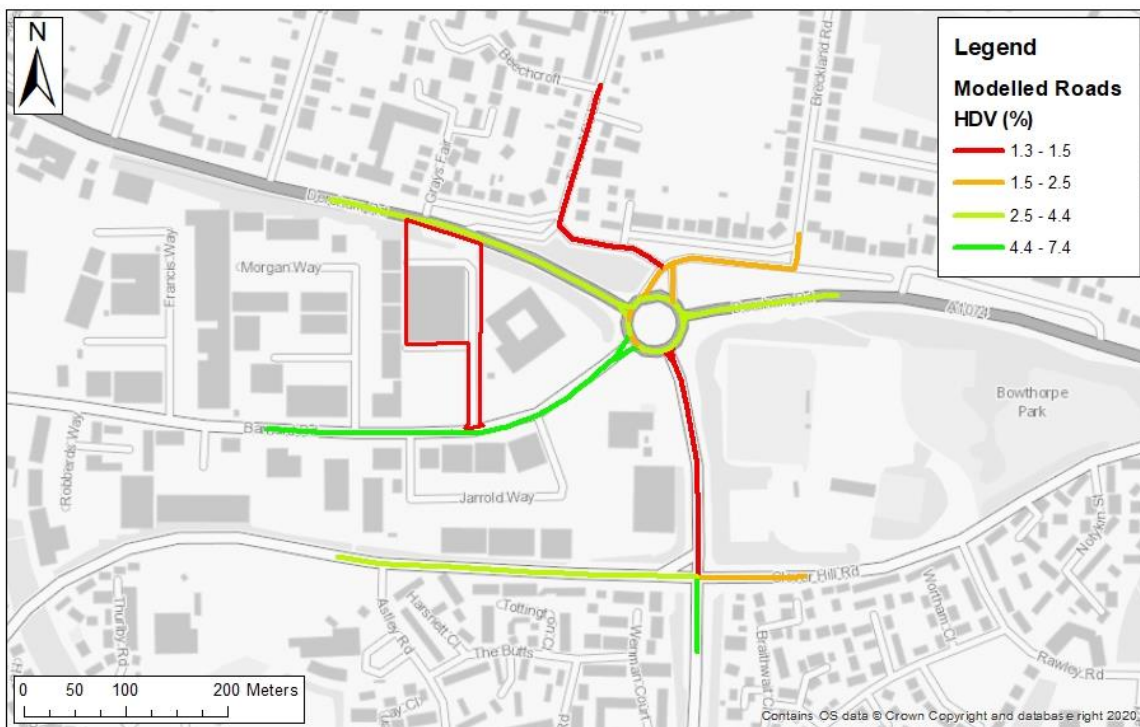


Figure E.8: Traffic Data (Future 'Without Scheme' Scenario HDV %)
Development Site

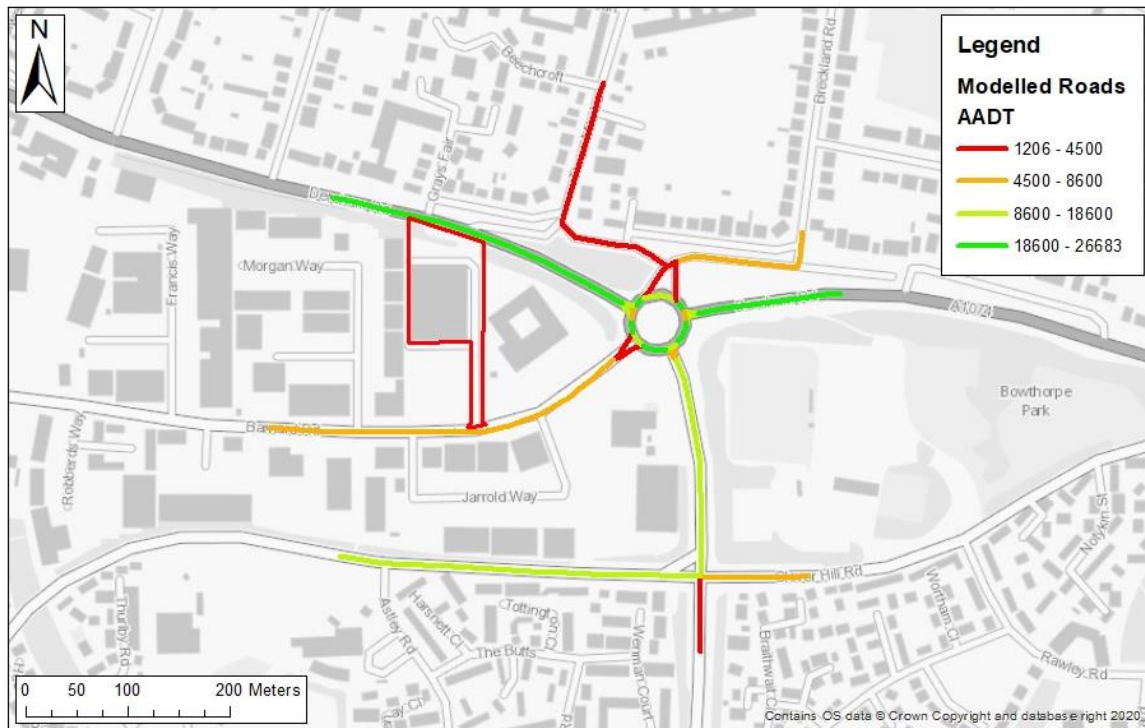


Figure E.9: Traffic Data (Future 'With Scheme' Scenario AADT) Development Site

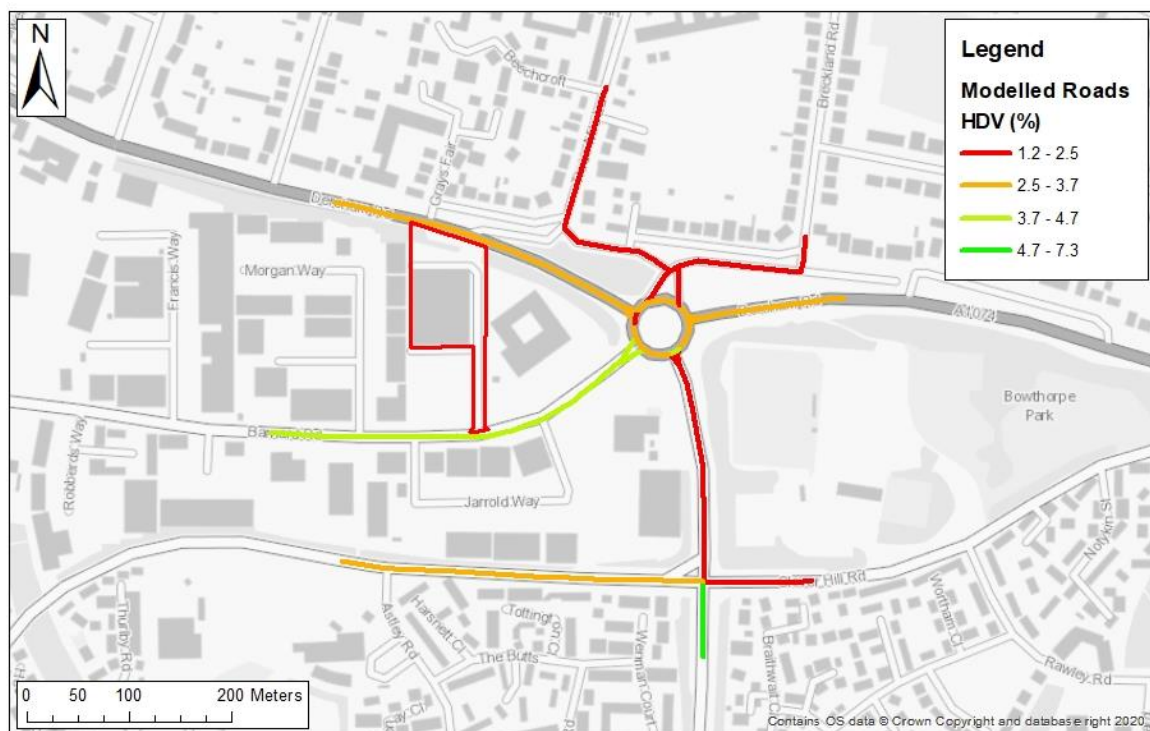


Figure E.10: Traffic Data (Future 'With Scheme' Scenario HDV %) Development Site