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**ENVIRONMENT**

# Britannia Victoria Limited
# Victoria Park Probation Centre
# Manchester
# Air Quality Assessment

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# Victoria Park Probation Centre
# Manchester
# Air Quality Assessment

Birmingham
Livery Place, 35 Livery Street, Colmore Business District
Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way
Leeds, LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11 Portland Street
Manchester, M1 3HU
T: 0161 233 4260

Nottingham
5th Floor, Waterfront House, Station Street
Nottingham, NG2 3DQ
T: 0115 924 1100

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# EXECUTIVE SUMMARY

BWB Consulting Limited was appointed by Britannia Victoria Limited to undertake a detailed air quality assessment for a proposed residential development at the former Victoria Park Probation Centre, on Laindon Road, Manchester.

The Site is located within the administrative area of Manchester City Council. The Site is not located within an existing Air Quality Management Area; however sections of the Greater Manchester Combined Authority Air Quality Management Area are within the vicinity of the Site. The closest section of the Air Quality Management Area is located approximately 160m north east of the Site. The Greater Manchester Combined Authority Air Quality Management Area was designated for the potential exceedance of the annual mean nitrogen dioxide air quality objective.

A qualitative construction phase dust assessment was undertaken in accordance with Institute of Air Quality Management guidance and measures were recommended for inclusion in a Dust Management Plan to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions was considered to be 'not significant' in accordance with Institute of Air Quality Management guidance.

A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing receptor locations. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of nitrogen dioxide and particulate matter ($PM_{10}$ and $PM_{2.5}$) were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance, Institute of Air Quality Management & Environmental Protection UK guidance and the Manchester City Council Air Quality & Planning Technical Guidance. The development was not predicted to result in any new exceedances of the relevant air quality objectives and the impact of the development on local air quality was predicted to be 'negligible' in accordance with guidance.

Pollutant concentrations were also predicted across the Site and the suitability of the Site for the proposed residential use was considered with regard to the current relevant air quality objectives. Pollutant concentrations were predicted to be below the current relevant air quality objectives and the Site was therefore considered suitable for the proposed residential use.

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# 1. INTRODUCTION

1.1 BWB Consulting Limited (BWB) was instructed by Britannia Victoria Limited (the Client) to undertake an air quality assessment for a proposed residential development at the former Victoria Park Probation Centre, on Laindon Road, Manchester ('the Site').

1.2 The assessment considers construction phase dust impacts and operational phase road traffic emissions. A qualitative construction phase dust assessment was undertaken in accordance with relevant guidance. A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified receptor locations. In addition, pollutant concentrations were predicted across the proposed development Site.

1.3 This report is necessarily technical in nature so to assist the reader a glossary of air quality terminology can be found in **Appendix A**.

## Site Setting

1.4 The Site is located in the south east of Manchester within the administrative area of Manchester City Council (MCC). **Figure 1.1** details the location of the proposed development. The Site currently comprises two buildings associated with the former Victoria Park Probation Centre and existing hardstanding.

1.5 The Site is bound to the north by Daisy Bank Road, with existing residential dwellings and St Joseph's RC Primary School beyond. To the east of the Site are existing residential dwellings, with the A6 Stockport Road located approximately 400m beyond. To the south of the Site are existing residential properties and student accommodation. To the west of the Site is Laindon Road, with existing residential dwellings beyond. The A34 Anson Road is also located approximately 550m to the west of the Site.

1.6 Principal air pollution sources in the vicinity of the Site are likely to comprise of road traffic emissions. The Site is not located within an Air Quality Management Area (AQMA); however sections of the study area are located within the Greater Manchester Combined Authority (GMCA) AQMA. The GMCA AQMA was declared for the potential exceedance of the current annual mean nitrogen dioxide ($NO_2$) air quality objective. The closest sections of the GMCA AQMA are approximately 160m north east of the Site, along the A5184 Plymouth Grove, and approximately 360m south of the Site, at the junction of Laindon Road and the A6010 Dickenson Road.

## Proposed Development

1.7 The proposed development comprises the demolition of the existing buildings on Site under prior approval, and the construction of circa 72 residential units through a mix of houses and apartments. The proposed development masterplan is detailed in **Appendix B**.

## Figure 1.1 Site Location

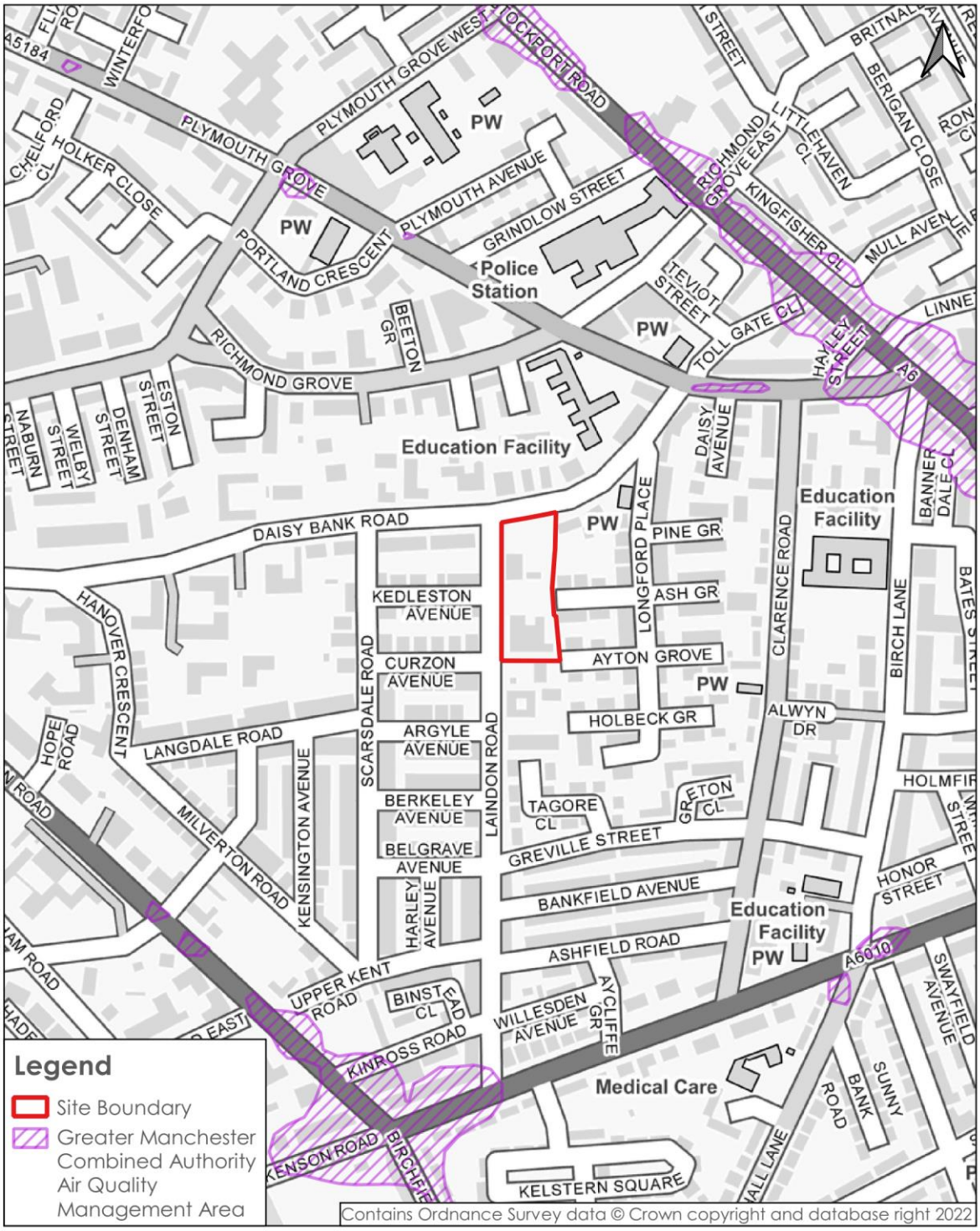


**Figure 1.1: Site Location**

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# 2. LEGLISLATION, PLANNING POLICY & GUIDANCE

## National Legislation and Planning Policy

2.1 The following national legislation and planning policy is relevant to air quality and was considered in the undertaking of the assessment. A summary of the relevant national legislation and planning policy is provided in **Appendix C**:

- European Parliament, EU 2008 ambient Air Quality Directive (2008)[1];
- HMSO, Air Quality (England) Regulations (2000)[2];
- HMSO, Environment Act (1995)[3];
- HMSO, Environment Act (2021)[4];
- HMSO, The Environmental Targets (Fine Particulate Matter) (England) Regulations (2023)[5];
- Department for Environment, Air Quality Strategy (1997)[6];
- Department for the Environment, Food and Rural Affairs, Air Quality Strategy (2007)[7];
- Department for the Environment, Food and Rural Affairs, The Environment (Miscellaneous Amendments) (EU Exit) Regulations (2020)[8];
- Ministry of Housing, Communities and Local Government, National Planning Policy Framework (NPPF) (2021)[9]; and
- Ministry for Housing, Communities and Local Government, Planning Practice Guidance (PPG) for air quality (2019)[10].

## Local Planning Policy

2.2 The following local planning policy was considered in the undertaking of the assessment and a summary is provided in **Appendix C**:

- Manchester City Council, Manchester's Local Development Framework: Core Strategy Development Plan Document (2012)[11]

## Air Quality Assessment Guidance

2.3 The following guidance was utilised in the air quality assessment:

- Defra, Local Air Quality Management Technical Guidance (LAQM.TG(22)) (2022)[12];

[1] European Parliament (2008) Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe
[2] HMSO (2000) Statutory Instrument 2000 No. 928, The Air Quality (England) Regulations 2000 (as amended), London: HMSO
[3] HMSO (1995) The Environment Act 1995, London: TSO
[4] HMSO (2021) The Environment Act 2021, London: TSO
[5] HMSO (2023) Statutory Instruments 2023 No. 96 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023
[6] Department of the Environment (DoE) (1997) The UK National Air Quality Strategy, London: HMSO
[7] Department of the Environment, Food and Rural Affairs (Defra) (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, London: HMSO
[8] Department of the Environment, Food and Rural Affairs (Defra) (2020) The Environment (Miscellaneous Amendments) (EU Exit) Regulations, London: HMSO
[9] Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework, HMSO London
[10] Ministry for Housing, Communities and Local Government (2019) Planning Practice Guidance Air Quality
[11] Manchester City Council (2012) Manchester's Local Development Framework: Core Strategy Development Plan Document
[12] Defra (2022) Local Air Quality Management Technical Guidance LAQM.TG(22)

- Institute of Air Quality Management, Guidance on the assessment of dust from demolition and construction (2014)[13];
- Institute of Air Quality Management and Environmental Protection UK, Land-Use Planning and Development Control: Planning for Air Quality (2017)[14]; and
- Manchester City Council, Air Quality & Planning Technical Guidance (2022)[15].

[13] Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London
[14] Institute of Air Quality Management and Environmental Protection UK (2017) Land-Use Planning and Development Control: Planning for Air Quality
[15] Manchester City Council (2022) Air Quality & Planning Technical Guidance

# 3. METHODOLOGY

## Consultation with Manchester City Council

3.1 Consultation was undertaken with the Environmental Health and Protection Department at MCC in which the proposed assessment methodology was provided via email on the 13th September 2022[16]. A response was received on the 26th September 2022 confirming acceptance of the proposed methodology.

3.2 The agreed methodology is detailed below:

- Construction Phase - A construction phase dust assessment was undertaken and relevant measures to mitigate construction phase dust emissions were recommended. The assessment was undertaken in accordance with guidance provided by the Institute of Air Quality Management (IAQM)[13].
- Operational Phase Road Traffic Emissions Exposure Assessment – A detailed operational phase road traffic emissions assessment was undertaken to consider the impact of development-generated traffic on local air quality and predict pollutant concentrations at the proposed development Site. The dispersion model ADMS-Roads was used to model concentrations of oxides of nitrogen (NOx) and particulate matter ($PM_{10}$ and $PM_{2.5}$) at identified existing receptor locations for both without and with development scenarios. The change in pollutant concentrations as a result of development-generated traffic was then calculated. The assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance (LAQM.TG22)[12] and IAQM and Environmental Protection UK (EPUK)[14]. Pollutant concentrations were predicted across the Site to consider the suitability of the Site for residential use.

3.3 Full details of the methodology used in the assessment, as agreed with MCC, are provided below.

3.4 Following the initial consultation, a further consultation email was provided to MCC on 20th October 2022[17]. Upon review of the MCC Air Quality & Planning Technical Guidance, the proposed development was classified as 'major' in accordance with the Town & Country Planning Act[18] as the proposals comprise more than 10 dwellings. However, as the Site is not located within an AQMA or adjacent to a major A-road, it was considered unlikely that the proposed development would introduce new relevant exposure into an area of poor quality. Furthermore, the predicted trip generation only marginally exceeds the relevant threshold criteria provided by the IAQM and EPUK guidance[14] for when a detailed air quality assessment may be required. Based on the above and the inclusion of measures within the development proposals which may be beneficial to air quality, such as Electric Vehicle (EV) charging and a Travel Plan, a damage cost calculation was not undertaken. At the time of assessment, a response to the additional consultation email was not received.

[16] Consultation email issued to MCC on 13/09/2022 and a response was received on 26/09/2022
[17] Updated consultation email issued to MCC on 20/10/2022
[18] HMSO (2015) Town and Country Planning (Development Management Procedure) (England), London: TSO

### Construction Phase Dust Assessment

3.5 An assessment of the potential impacts arising from the construction of the proposed development was undertaken in accordance with IAQM Guidance[13]. The full assessment methodology is not reproduced within this report but a summary of the assessment steps are provided below:

- Step 1 – screen the requirement for a more detailed assessment. No assessment is required if there are no receptors within a certain distance of the works.
- Step 2 – assess the risk of dust impacts separately for each of the four activities considered (demolition, earthworks, construction and trackout).
    - Step 2A – determine the potential dust emission magnitude for each of the four activities;
    - Step 2B – determine the sensitivity of the area;
    - Step 2C – determine the risk of dust impacts by combining the findings of steps 2A and 2B.
- Step 3 – determine the site-specific mitigation for each of the four activities; and
- Step 4 – examine the residual effects and determine significance.

### Operational Phase Road Traffic Emissions – Detailed Assessment

3.6 Guidance published by the IAQM and EPUK in 2017[14] provides a two-stage approach to determine the level of assessment required in the consideration of the impact of development-generated road traffic emissions on local air quality.

<u>Stage 1</u>

3.7 The Stage 1 criteria requires that the assessment progress to Stage 2 if any of the following apply:

- The development comprises:
    - 10 or more residential units or a site area of more than 0.5ha; or
    - More than 1,000m2 of floor space for all other uses or a site area greater than 1ha;
- Coupled with any of the following:
    - The development has more than 10 parking spaces; or
    - The development will have a centralised energy facility or other centralised combustion process.

<u>Stage 2</u>

3.8 The IAQM and EPUK guidance[12] provides the following indicative criteria to determine whether a detailed road traffic emissions assessment is required for a proposed development.

3.9 The Stage 2 criteria relevant to the Proposed Development are:

- A change in Light Duty Vehicles (LDV) of more than 100 vehicles as a 24 hour Annual Average Daily Traffic (AADT) flow within an AQMA; and/or
- A change in HDV flow of more than 25 vehicles as a 24-hour AADT flow within an AQMA.

3.10 The proposed development comprises more than ten residential units and therefore it was necessary to proceed to Stage 2 of the IAQM and EPUK guidance. It was confirmed by Curtins, the project's Transport Consultant, that the predicted trip generation exceeds the threshold criteria of a change in LDV AADT flows in the GMCA AQMA. As such, a detailed air quality assessment was undertaken.

Air Dispersion Modelling

3.11 The air dispersion model ADMS-Roads, version 5.0.1.3 was utilised in the assessment to predict concentrations of NOx, $PM_{10}$ and $PM_{2.5}$ at existing receptor locations and across the Site.

3.12 The assessment was undertaken in accordance with Defra LAQM(TG22)[12] and the IAQM and EPUK guidance[14].

Assessment Scenarios and Traffic Data

3.13 The following scenarios were considered in the air dispersion modelling:

- Scenario 1: 2019 Verification Year;
- Scenario 2: 2022 Base Year;
- Scenario 3: 2025 Opening Year without development; and
- Scenario 4: 2025 Opening Year with development.

3.14 Traffic data were obtained from Curtins, the Transport Consultants for the project. 24-hour Annual Average Daily Traffic Data (AADT) and Heavy Duty Vehicle (HDV) proportions were provided for the following roads for use in the assessment:

- A57 Hyde Road;
- A6010 Dickenson Lane;
- A6010 Pottery Lane;
- A5184 Plymouth Grove;
- Daisy Bank Road; and
- Laindon Road.

3.15 Consideration was given to the speeds at which vehicles are likely to travel within the study area. Free flowing traffic conditions were modelled at speed limits. Queuing sections were modelled in accordance with Defra guidance[12].

3.16 Traffic data used in the air dispersion modelling are provided in **Appendix D**.

## ADMS-Roads Model Inputs

3.17 The following model inputs were utilised in the assessment:

- Emission Factors – emission factors were utilised from the Defra Emission Factor Toolkit[19] (EFT), version 11, for the years of assessment (2019, 2022 and 2025).
- Conversion of oxides of nitrogen – concentrations of NOx were predicted using the ADMS-Roads dispersion model. These concentrations were converted to nitrogen dioxide ($NO_2$) using the Defra NOx to $NO_2$ calculator[20], version 8.1.
- Meteorological Data – hourly sequential meteorological data for the verification year of assessment (2019) were obtained for the Manchester Airport meteorological recording station. This is the closest meteorological station to the Site and is considered to be most representative of the Site and study area due to the urban fringe location. The wind rose for 2019 is provided in **Appendix E**.
- Surface roughness and Monin-Obukhov length (MO) – Site – a surface roughness of 1.0m and a MO length of 100m were utilised in the air dispersion model to represent conditions at the Site and within the study area. These conditions are representative of the location of the Site within an urban area of Manchester.
- Surface roughness and Monin-Obukhov length (MO) – Meteorological Station – a surface roughness of 0.5m and a MO length of 30m were utilised in the air dispersion model to represent conditions at the meteorological station. These conditions were used to represent an average of the mixed urban/industrial conditions north of the Manchester Airport meteorological recording station and the rural conditions located to the south.
- Background pollutant concentrations – background concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ for the study area were obtained from the pollutant concentration maps[21] provided by Defra as a 1km x 1km grid of the UK, for the years of assessment (2019, 2022 and 2025).
- Model verification – model verification was undertaken using 2019 monitoring data available for the study area. Full details of the verification procedure are provided in **Appendix F**.
- Calculation of short term $PM_{10}$ concentrations – the following calculation, as detailed in Defra guidance[12], was utilised to calculate the number of exceedances of the 24-hour mean $PM_{10}$ air quality objective:

$$\text{Number of 24-Hour Mean Exceedance} = -18.5 + 0.00145 * \text{Annual Mean}^3 + (206 / \text{Annual Mean})$$

- The IAQM released a position statement[22] in July 2018 regarding dealing with the uncertainty in vehicle NOx emissions within air quality assessments. The position statement recommended that sensitivity analyses be undertaken to consider the scenario where NOx emissions do not reduce as rapidly in future years as predicted within the EFT15. The IAQM position statement was withdrawn in July 2021 following extensive research which identified that EFT v8.1 and onwards were considered to more accurately represent real world NOx emissions. No sensitivity analysis was therefore undertaken as part of the air quality assessment.

[19] Defra (2019) Emission Factor Toolkit [https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html]
[20] Defra (2019) NOx to $NO_2$ Calculator [https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc]
[21] Defra (2019) background pollutant concentration maps [https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2019]
[22] Institute of Air Quality Management (2018) Position Statement: Dealing with Uncertainty in Vehicle NOx Emissions within Air Quality Assessments, Version 1.1

## Receptor Locations

*Existing Sensitive Receptors*

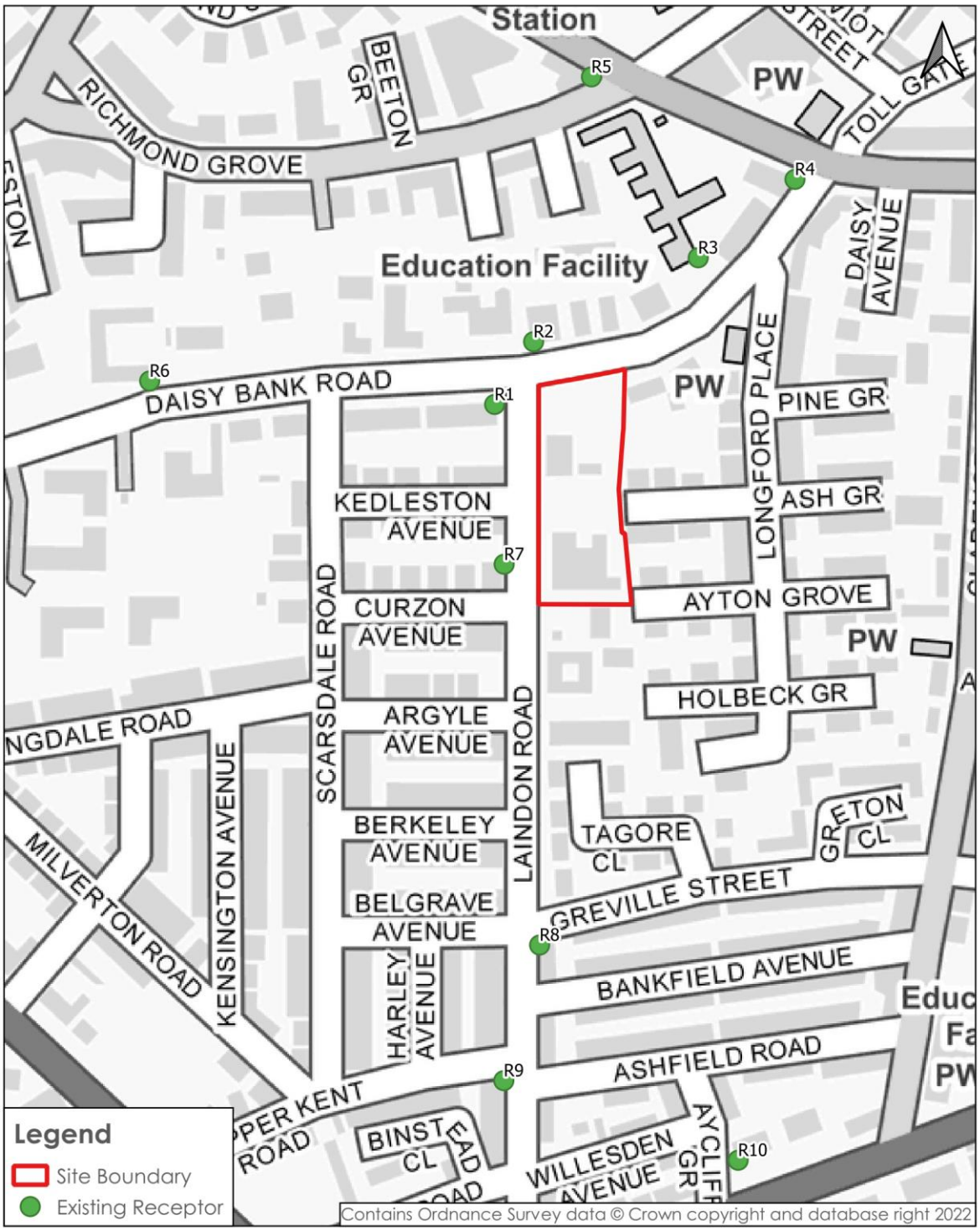
3.18 Existing receptor locations were identified within close proximity of the road links detailed in paragraph 3.14 and considered in the operational phase road traffic emissions assessment. Concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were predicted at the identified existing receptor locations for the assessment scenarios detailed in paragraph 3.13. Where possible the closest receptors to those road links were considered, as these receptors are likely to experience the greatest change in pollutant concentrations as a result of the proposed development. Receptor heights were modelled at 1.5m to represent average breathing height at ground floor. The exceptions to this were receptors R3, R6 and R10 which were modelled at a height of 0.8m to represent the lower than average breathing height of children at nursery and primary schools.

3.19 The existing receptor locations are detailed in Table 3.1 and Figure 3.1.

**Table 3.1: Existing Sensitive Receptor Locations**

| Receptor | Grid Reference | | Details | Height Modelled |
|---|---|---|---|---|
| | X | Y | | (m) |
| R1 | 386130 | 395781 | Residential receptor on Daisy Bank Road | 1.5 |
| R2 | 386152 | 395816 | Residential receptor on Daisy Bank Road | 1.5 |
| R3 | 386244 | 395863 | Primary school on Richmond Grove | 0.8 |
| R4 | 386298 | 395907 | Residential receptor on Daisy Bank Road | 1.5 |
| R5 | 386184 | 395964 | Residential receptor on Plymouth Grove | 1.5 |
| R6 | 385937 | 395794 | Nursery on Daisy Bank Road | 0.8 |
| R7 | 386135 | 395692 | Residential receptor on Laindon Road | 1.5 |
| R8 | 386155 | 395479 | Residential receptor on Laindon Road | 1.5 |
| R9 | 386135 | 395403 | Residential receptor on Laindon Road | 1.5 |
| R10 | 386266 | 395359 | Nursery along A6010 Dickenson Road | 0.8 |

**Figure 3.1: Existing Receptor Locations**




0 100 200 300 m

**Figure 3.1: Existing Receptor Locations**

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*Proposed Receptor Locations*

3.20 Pollutant concentrations were predicted across the proposed development Site to consider exposure of future residents of the proposed development to air quality. A Cartesian grid from minimum X 386043, Y 395656 to maximum X 386254, Y 395872, modelled at a height of 1.5m, was included to predict pollutant concentrations across the Site to consider its suitability for the proposed sensitive end use.

## Limitations and Assumptions

3.21 There are uncertainties associated with both measured and predicted pollutant concentrations. The model (ADMS-Roads) used in this assessment relies on input data, which are also subject to uncertainty. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS-Roads model will not take into account.

3.22 The assessment is based on traffic data provided by Curtins, the transport consultants for the project. As such any assumptions made by the transport consultants will also influence the air quality assessment. In the absence of readily available baseline data for Laindon Road and Daisy Bank Road, proxy flows from minor roads within the surrounding road network were provided by the Transport Consultants and were utilised in the assessment. Further details on the traffic data used in the assessment are available in **Appendix D**.

3.23 In future year scenarios, uncertainty relates to the projection of vehicle emissions and, in particular, the rate at which emissions per vehicle will improve over time. This assessment utilised the most recent version of the Defra EFT[19] to provide the most up to date estimate of current and future emission projections.

3.24 To reduce the uncertainty associated with predicted concentrations, model verification was carried out following guidance set out in Defra guidance[12]. As the models were verified using local monitoring data and adjusted accordingly, there can be reasonable confidence in the predicted concentrations.

## Assessment Criteria

3.25 Predicted pollutant concentrations were compared to the relevant air quality objectives[6]. The current relevant air quality standards and objectives are detailed in **Table 3.2**.

**Table 3.2: Air Quality Standards and Objectives (England)**

| Pollutant | Averaging Period | Air Quality Objective ($\mu g.m^{-3}$) | Date to Achieve by |
|---|---|---|---|
| $NO_2$ | Annual Mean | 40 | 31 December 2005 |
| | 1-hour mean not to be exceeded more than 18 times per year | 200 | 31 December 2005 |

| Pollutant | Averaging Period | Air Quality Objective ($\mu g.m^{-3}$) | Date to Achieve by |
|---|---|---|---|
| $PM_{10}$ | Annual Mean | 40 | 31 December 2004 |
| | 24-hour mean not to be exceeded more than 35 times per year | 50 | 31 December 2004 |
| $PM_{2.5}$ | Annual mean | 20 | –1 January 2020 |
| | *Annual mean* | *10* | *31 December 2040* |
| | *Annual mean interim target as detailed within the Environmental Improvement Plan*[23] | *12* | *31 January 2028* |

*Italics denotes future air quality objectives that will come into force in the future.*

3.26 Guidance is provided by the Institute of Air Quality Management and Environmental Protection UK[14] to determine the significance of the impact of development-generated road traffic emissions on local air quality. The impact descriptors at receptor locations are detailed in **Table 3.3.** These impact descriptors consider the predicted magnitude of change in pollutant concentrations and the concentration in relation to the relevant air quality objectives.

**Table 3.3: Impact Descriptors for Individual Receptors**

| Long Term Average Concentration at Receptor in Assessment Year | % Change in Concentration Relative to Air Quality Assessment Level (AQAL) | | | |
|---|---|---|---|---|
| | 1% | 2 – 5% | 6 – 10% | >10% |
| 75% or less of AQAL | Negligible | Negligible | Slight | Moderate |
| 76 – 94% of AQAL | Negligible | Slight | Moderate | Moderate |
| 95 – 102% of AQAL | Slight | Moderate | Moderate | Substantial |
| 103 – 109% of AQAL | Moderate | Moderate | Substantial | Substantial |
| 110% or more of AQAL | Moderate | Substantial | Substantial | Substantial |

*Note: Figures rounded up to the nearest whole number, therefore any value less than 1% after rounding (effectively less than 0.5%) will be described as negligible.*

[23] Defra (2023) Environmental Improvement Plan 2023, First revision of the 25 Year Environment Plan

# 4. BASELINE CONDITIONS

## Local Air Quality Management

4.1 The Site is not located within an existing AQMA. However, there sections of the road network surrounding the Site are located within the existing GMCA AQMA. The closest of these sections are approximately 160m north east of the Site, along the A5184 Plymouth Grove, and approximately 360m south of the Site, at the junction of Laindon Road and the A6010 Dickenson Road. The GMCA AQMA was designated for the potential exceedance of the current annual mean air quality objective for $NO_2$.

## Local Air Quality Monitoring

### Nitrogen Dioxide

4.2 GMCA undertakes $NO_2$ monitoring within its administrative boundary using a network of automatic monitoring stations and diffusion tubes. The closest monitoring location to the Site is an urban background diffusion tube (MA79NO), approximately 680m east of the Site.

4.3 Bias adjusted $NO_2$ monitoring results, for the locations in the vicinity of the Site, are detailed in **Table 4.1**. Exceedances of the annual mean $NO_2$ objective are highlighted in **bold.**

4.4 At the time of assessment 2020 and 2021 was available to review. However, due to the influence of the COVID-19 pandemic lockdown restrictions, 2020 and 2021 monitoring data is not considered representative of normal conditions. The IAQM released a position statement[24] in August 2021 with regard to 2020 and 2021 monitoring datasets, which recommends that until the influence of the COVID-19 pandemic is fully understood, 2019 monitoring data should be treated as the last year of typical monitoring data.

**Table 4.1: GMCA $NO_2$ Monitoring Data in 2015 – 2021**

| Location and Reference | Grid Reference | | Site Monitoring Type | Distance from and direction to Site boundary | Monitored Annual Average Concentration ($\mu g.m^{-3}$) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| MA75NO Stockport Road | 387363 | 394617 | Kerbside | 1.5km south east | **46.5** | **51.5** | **47.7** | **47.6** | **47.0** | 33.7 | 39.0 |
| MA79NO Victoria Terrace | 386875 | 395861 | Urban Background | 680m east | 30.5 | 32.7 | 31.8 | 29.9 | 29.3 | 22.3 | 25.6 |
| MA86ANO Pottery Lane | 387150 | 396808 | Roadside | 1.3km north east | 31.5 | 36.7 | 36.9 | 32.1 | 33.6 | 25.5 | 27.5 |

[24] Institute of Air Quality Management (IAQM) (2020) Implications of the COVID-19 Pandemic on Air Quality Monitoring and Assessments

| Location and Reference | Grid Reference | | Site Monitoring Type | Distance from and direction to Site boundary | Monitored Annual Average Concentration (µg.m$^{-3}$) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| MA87ANO Hyde Road/Pottery Lane | 386992 | 396569 | Roadside | 1.1km north east | 35.2 | 37.1 | 37.2 | 33.2 | 34.0 | 22.9 | 26.4 |
| MA88ANO Hyde Road/Clowes Street | 386526 | 396699 | Roadside | 950m north east | **41.2** | **52.7** | **47.5** | **44.3** | **43.3** | 32.5 | 35.3 |
| MA89NO Wenlock Way | 386710 | 396824 | Roadside | 1.2km north east | 30.4 | 35.7 | 34.4 | 30.3 | 30.3 | 23.7 | 25.2 |

4.5 Monitored annual mean $NO_2$ concentrations were below the current relevant $NO_2$ annual mean air quality objective at the majority of diffusion tubes within the study area in the last five years of representative monitoring data. The exception to this is monitoring locations MA88ANO and MA75NO where exceedances of the annual mean $NO_2$ objective of 40µg.m$^{-3}$ were recorded between 2015 – 2019. Both monitoring locations are situated within the GCMA AQMA, with MA75NO also situated at a kerbside location; therefore elevated $NO_2$ concentrations are anticipated.

4.6 A decrease in $NO_2$ concentrations is shown across all monitoring location detailed in **Table 4.1** between 2016 and 2019.

4.7 The MA79NO urban background diffusion tube is the closest monitoring location to the Site and is set back approximately 55m from the closest major road. MA79NO is however located adjacent to the Manchester Piccadilly to Crewe railway line; which comprises heavy traffic of diesel passenger trains, as detailed within the Defra guidance[12]. Therefore, background annual mean $NO_2$ concentrations at this location are likely to be higher than those at the Site, as the Site is not located within close proximity of the railway line. Therefore MA79NO was not utilised in the assessment to provide background concentrations.

4.8 The Site is not located within an AQMA and therefore annual mean $NO_2$ concentrations recorded at MA86ANO, MA87ANO and MA88ANO were not considered to be representative of conditions at the Site. However, as traffic associated with the proposed development is predicted to travel through sections of the AQMA, these diffusion tubes were utilised in the verification process to represent existing sensitive receptors within the wider study area. Further details of the verification process are provided in **Appendix F**.

Particulate Matter

4.9 No representative monitoring of $PM_{10}$ and $PM_{2.5}$ is undertaken within the vicinity of the Site or within the wider study area.

## Background Pollutant Concentrations

4.10 No representative background air quality monitoring is undertaken by MCC within the study area. Background pollutant concentrations were therefore obtained from the latest Defra background concentration maps[21], which are provided for the UK as a 1km x 1km grid network. The latest maps are based on 2018 monitoring and meteorological data. Background concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were obtained for the grid squares covering the study area for the years of assessment (2019, 2022 and 2025). The background concentrations used in the assessment are detailed in **Table 4.2.**

**Table 4.2: Background Pollutant Concentrations used in the Assessment**

| Pollutant | Grid Square | Monitoring Locations / Receptors | Concentration (µg.m$^{-3}$) | | |
|---|---|---|---|---|---|
| | | | 2019 | 2022 | 2025 |
| *Monitoring Locations Used in Verification* | | | | | |
| $NO_2$ | 387500, 396500 | MA86ANO | 18.6 | Background concentrations not required for these assessment years | |
| $PM_{10}$ | | | 13.0 | | |
| $PM_{2.5}$ | | | 8.7 | | |
| $NO_2$ | 386500, 396500 | MA87ANO, MAA88NO | 19.0 | | |
| $PM_{10}$ | | | 12.5 | | |
| $PM_{2.5}$ | | | 8.4 | | |
| *Receptors* | | | | | |
| $NO_2$ | 385500, 395500 | R1-R5, R7-R10 | 19.4 | 17.1 | 15.4 |
| $PM_{10}$ | | | 13.2 | 12.7 | 12.3 |
| $PM_{2.5}$ | | | 8.8 | 8.5 | 8.3 |
| $NO_2$ | 386500, 395500 | R6 | 18.7 | 16.6 | 15.0 |
| $PM_{10}$ | | | 12.7 | 12.2 | 11.9 |
| $PM_{2.5}$ | | | 8.4 | 8.1 | 7.9 |

4.11 As shown in **Table 4.2** background concentrations are below the current and future relevant annual mean air quality objectives for $NO_2$, $PM_{10}$ and $PM_{2.5}$ in all assessment years.

# 5. CONSTRUCTION PHASE DUST ASSESSMENT

5.1 The construction phase of the proposed development will involve a number of activities which have the potential to impact on local air quality. These include emissions of dust generated through demolition, excavation, construction, earthworks and trackout activities, exhaust pollutant emissions from construction traffic on the local highways network, and exhaust emissions from non-road mobile machinery (NRMM) within the construction site itself.

5.2 The location of sensitive receptors in relation to construction activities will affect the potential for such construction activities to cause dust soiling, nuisance and local air quality impacts. Meteorological conditions and the use of control measures will also contribute to the effects experienced.

### Step 1: Screen the Need for a Detailed Assessment

5.3 Step 1 of the IAQM guidance[13] involves a screening assessment to consider whether a more detailed construction phase dust assessment is required.

5.4 In accordance with the guidance, a detailed assessment is required if:

- Human receptors are located within 350m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 500m from the site entrances; or
- Ecological receptors are located within 50m of the boundary of the site or 50m of routes used by construction vehicles on the public highways, up to 500m from the site entrances.

5.5 From a review of the Multi Agency Geographic Information for the Countryside (MAGIC) website[25], no ecological designations were identified within the above screening distance and therefore the impact on ecological designations was not considered further. However human receptors are located within the above screening distances, with the closest of these receptors located off Ayton Grove. A construction phase assessment was therefore undertaken.

### Step 2: Assess the Risk of Dust Impacts

#### Step 2A: Define the Potential Dust Emission Magnitude

5.6 The dust emission magnitudes for the construction activities were defined using the criteria detailed in the IAQM guidance[13] as detailed in **Table 5.1**.

[25] Defra, Multi Agency Geographic Information for the Countryside (MAGIC) [http://magic.defra.gov.uk/]

**Table 5.1: Dust Emission Magnitude Criteria and Definition**

| Activity | IAQM Dust Emission Magnitude | IAQM Dust Emission Magnitude Criteria |
|---|---|---|
| Demolition | Large | Total building volume >50,000m$^3$, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20m above ground level. |
| | Medium | Total building volume 20,000m$^3$ – 50,000m$^3$, potentially dusty construction material, demolition activities 10 - 20m above ground level. |
| | Small | Total building volume <20,000m$^3$, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months. |
| Earthworks | Large | Total site area >10,000m$^2$, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8 m in height, total material moved >100,000 tonnes. |
| | Medium | Total site area 2,500m$^2$ – 10,000m$^2$, moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4m - 8m in height, total material moved 20,000 tonnes – 100,000 tonnes. |
| | Small | Total site area <2,500m$^2$, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes, earthworks during wetter months. |
| Construction | Large | Total building volume >100,000m$^3$, on site concrete batching, sandblasting. |
| | Medium | Total building volume 25,000m$^3$ – 100,000m$^3$, potentially dusty construction material (e.g. concrete), on site concrete batching. |
| | Small | Total building volume <25,000m$^3$, construction material with low potential for dust release (e.g. metal cladding or timber). |
| Trackout | Large | >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m. |
| | Medium | 10 - 50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m. |
| | Small | <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m. |

5.7 The following dust emissions magnitudes were defined for the proposed development:

- Demolition – The proposed development will require the demolition of all existing buildings within the Site. The total building volume to be demolished is less than 20,000m$^3$ and the maximum height of the buildings to be demolished is less than 10m above ground level. The dust emissions magnitude for demolition was therefore defined as '**Small**'.
- Earthworks – The proposed development has a total Site area between 2,500m$^2$ and 10,000m$^2$ and therefore the dust emissions magnitude for earthworks was defined as '**Medium**'.
- Construction – The total volume of the buildings to be constructed is between 25,000m$^3$ and 100,000m$^3$ and therefore the dust emissions magnitude for construction was defined as '**Medium**'.
- Trackout – There is anticipated to be less than 10 HDV outward movements in any one day during the peak of the construction phase and therefore the dust emissions magnitude for trackout was defined as '**Small**'. A trackout distance of up to 50m from the Site access was used in the assessment in accordance with the IAQM guidance[14].

5.8 A summary of the defined dust emissions magnitudes for the development are provided in **Table 5.2**.

**Table 5.2: Summary of Project Defined Dust Emissions Magnitudes**

| Activity | Dust Emissions Magnitude |
|---|---|
| Demolition | Small |
| Earthworks | Medium |
| Construction | Medium |
| Trackout | Small |

Step 2B: Define the Sensitivity of the Area

5.9 The assessment requires the determination of the sensitivity of the area for the purposes of dust soiling and human health. The sensitivity of the study area takes into account the specific receptors in the vicinity of the Site, the proximity and number of those receptors, the local background concentration of $PM_{10}$ and site-specific factors. **Figure 5.1** was utilised to determine the number of receptors located within the distance bands provided in the IAQM guidance[13] for determining receptor sensitivity.

5.10 The sensitivity of the area is defined below, in accordance with IAQM criteria[13] and summarised in **Table 5.3**.

- Dust Soiling – There are ten to 100 highly sensitive residential receptors within 20m of the Site. In addition, there are between ten and 100 highly sensitive residential receptors located within 20m of the roads used by construction traffic and therefore the sensitivity of the area to dust soiling was defined as '**High**'.
- Human Health – There are ten to 100 highly sensitive residential receptors within 20m of the Site and there are between ten and 100 highly sensitive residential receptors located within 20m of the roads used by construction traffic. The current background levels of $PM_{10}$ at the Site are below 24µg.m$^{-3}$. Therefore, the sensitivity of the Site to human health impact was defined as '**Low**'.

**Table 5.3: Determination of the Sensitivity of the Area**

| Potential Impact | Sensitivity | | | |
|---|---|---|---|---|
| | Demolition | Earthworks | Construction | Trackout |
| Dust Soiling | High | High | High | High |
| Human Health | Low | Low | Low | Low |

**Figure 5.1: Construction Phase Assessment Dust Distance Buffers**

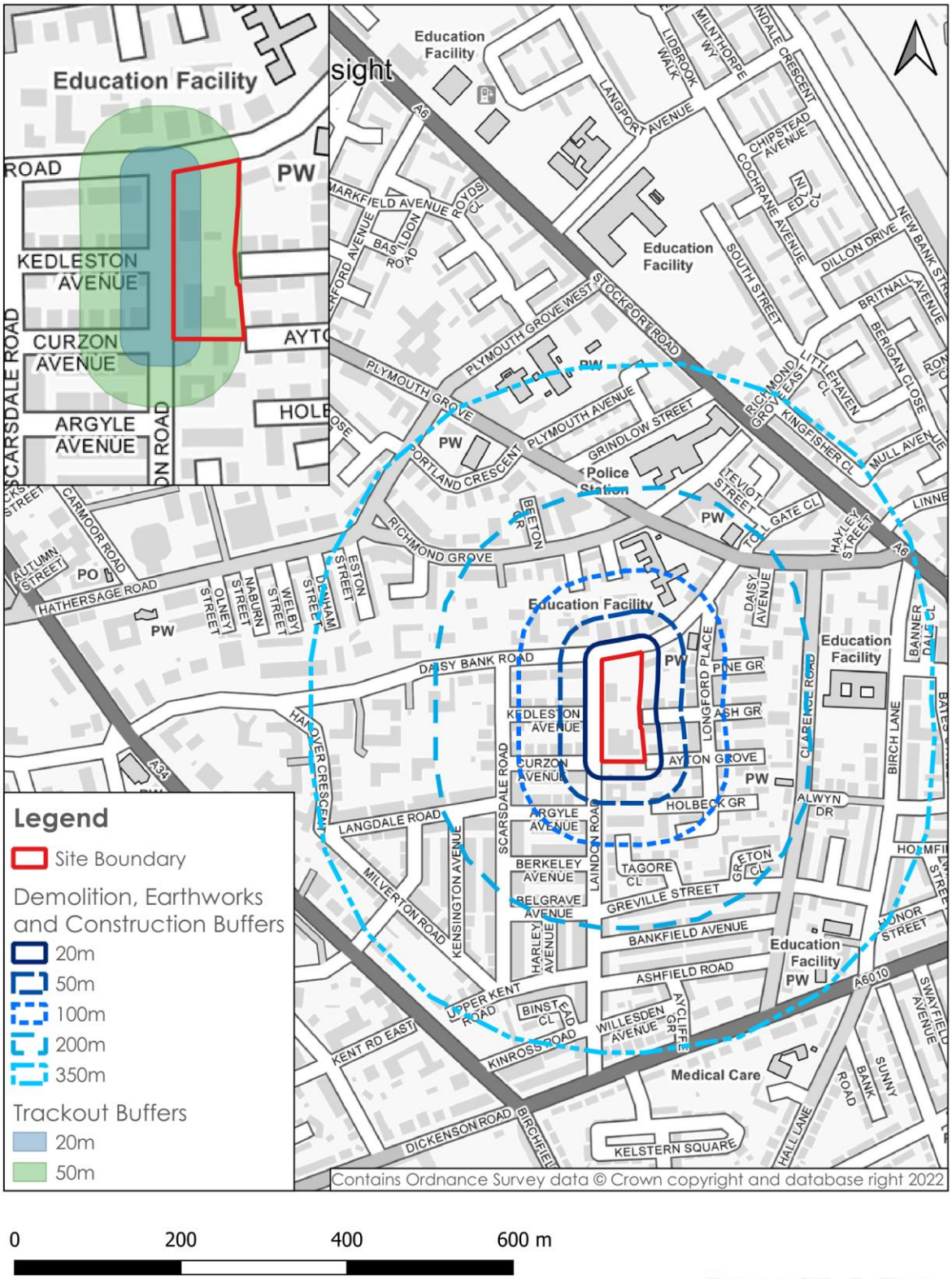


**Figure 5.1: Construction Phase Dust Assessment Distance Buffers**

Drawn by: BR
Date: 26/10/2022

BWB
A CAF GROUP COMPANY

Step 2C: Define the Risk of Impacts

5.11 The dust emission magnitude determined in Step 2A is then combined with the sensitivity of the area determined in Step 2B to define the risk of dust impacts with no mitigation applied. The results of this assessment are detailed in **Table 5.4.**

**Table 5.4: Summary Dust Risk Table to Define Site Specific Risk**

| Activity | Step 2A: Dust Emission Magnitude | Step 2B: Sensitivity of the Area | Step 2C: Risk of Dust Impacts |
|---|---|---|---|
| ***Dust Soiling Effects on People and Property*** | | | |
| Demolition | Small | High | Medium Risk |
| Earthworks | Medium | High | Medium Risk |
| Construction | Medium | High | Medium Risk |
| Trackout | Small | High | Low Risk |
| ***Human Health Impacts*** | | | |
| Demolition | Small | Low | Negligible |
| Earthworks | Medium | Low | Low Risk |
| Construction | Medium | Low | Low Risk |
| Trackout | Small | Low | Negligible |

## Step 3: Site-Specific Mitigation

5.12 The risk of dust impacts, defined in Step 2C of the assessment, is used to determine the mitigation measures required to minimise the emission of dust during construction phase activities. The IAQM guidance[13] provides details of highly recommended and desirable mitigation measures which are commensurate with the risk of dust impacts defined in Step 2C for demolition, construction, earthworks and trackout activities. Where the mitigation measures are general in nature, the highest risk category was applied in accordance with the guidance[13]. The highest risk category identified was 'Medium Risk' and the recommended mitigation taken from the IAQM guidance[13] is detailed in **Table 5.5** and **Table 5.6**.

**Table 5.5: Mitigation Measures for a Medium Risk Site**

| Category | Mitigation Measures for a Medium Risk Site | |
|---|---|---|
| | **Highly Recommended** | **Desirable** |
| Communication | Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. | None |
| | Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager. | |
| | Display the head or regional office contact information. | |
| | Develop and implement a Construction Environmental Management Plan (CEMP) which may include measures to control other emissions, approved by the Local Authority. | |
| Site Management | 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. | None |
| | Make the complaints log available to the local authority when asked. | |
| | Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book. | |
| Monitoring | Carry out regular site inspections to monitor compliance with the CEMP, record inspections results, and make an inspection log available to the local authority when asked. | 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 100m of the site boundary, with cleaning to be provided as necessary. |
| | 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. | |
| Preparing and maintaining the site | Plan the site layout so that machinery and dust causing activities are located away from receptors, as far as is possible. | None |
| | 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 extended period. | |
| | Avoid site runoff of water or mud. | |

| Category | Mitigation Measures for a Medium Risk Site | |
|---|---|---|
| | **Highly Recommended** | **Desirable** |
| | Keep site fencing, barriers and scaffolding clean using wet methods. | |
| | Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below. | |
| | Cover, seed or fence stockpiles to prevent wind whipping. | |
| Operating vehicle/ machinery and sustainable travel | Ensure all vehicles switch off engines when stationary – no idling vehicles. | Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate). |
| | Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable. | Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing). |
| | Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials. | |
| 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. | None |
| | Ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. | |
| | Use enclosed chutes and conveyors and covered skips. | |
| | Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. | |
| | Ensure equipment is readily available on site to clean and 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. | None |

**Table 5.6: Mitigation Measures Specific to Demolition, Earthworks, Construction and Trackout**

| Category | Mitigation Measures | |
|---|---|---|
| | Highly Recommended | Desirable |
| Demolition (Medium Risk Site) | 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. | Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). |
| | Avoid explosive blasting, using appropriate manual or mechanical alternatives. | |
| | Bag and remove any biological debris or damp down such material before demolition. | |
| Earthworks (Medium Risk Site) | None | Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable. |
| | | Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable. |
| | | Only remove the cover in small areas during work and not all at once. |
| Construction (Medium Risk Site) | 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. | Avoid scabbling (roughening of concrete surfaces) if possible. |
| | | 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. |
| | | For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust. |
| Trackout (Low Risk Site) | None | Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any materials tracked out of the site. This may require the sweeper being continuously in use. |
| | | Avoid dry sweeping of large areas. |
| | | Ensure vehicles entering and leaving the sites are covered to prevent escape of materials during transport. |
| | | Record all inspections of haul routes and any subsequent action in a site log book. |

| Category | Mitigation Measures | |
|---|---|---|
| | Highly Recommended | Desirable |
| | | Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable). |

### Step 4: Determine Significant Effects

5.13 In accordance with IAQM guidance[13], with the implementation of the mitigation measures detailed in Step 3, the residual impacts from the construction phase are considered to be 'not significant'.

# 6. OPERATIONAL PHASE ROAD TRAFFIC EMISSIONS ASSESSMENT

## Baseline Assessment

6.1 Pollutant concentrations were predicted at the identified existing sensitive receptor locations using the dispersion model ADMS-Roads. Predicted pollutant concentrations for Scenario 2: 2022 Base Year and Scenario 3: 2025 Opening Year without development are detailed in **Table 6.1.**

**Table 6.1: Predicted Annual Mean Pollutant Concentrations for Scenario 2: 2022 Base Year and Scenario 3: 2025 Opening Year Without Development at Existing Receptor Locations**

| Receptor | Scenario 2: 2022 Base Year ($\mu g.m^{-3}$) | | | Scenario 3: 2025 Opening Year Without Development ($\mu g.m^{-3}$) | | |
|---|---|---|---|---|---|---|
| | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| R1 | 19.6 | 13.2 | 8.8 | 17.4 | 12.9 | 8.6 |
| R2 | 20.2 | 13.4 | 8.9 | 17.9 | 13.1 | 8.7 |
| R3 | 19.4 | 13.2 | 8.8 | 17.2 | 12.9 | 8.6 |
| R4 | 23.9 | 14.3 | 9.4 | 20.8 | 14.1 | 9.2 |
| R5 | 21.9 | 13.9 | 9.2 | 19.2 | 13.7 | 9.0 |
| R6 | 18.5 | 12.6 | 8.4 | 16.6 | 12.3 | 8.1 |
| R7 | 18.5 | 13.0 | 8.7 | 16.5 | 12.7 | 8.4 |
| R8 | 18.6 | 13.0 | 8.7 | 16.6 | 12.7 | 8.5 |
| R9 | 18.9 | 13.1 | 8.7 | 16.8 | 12.8 | 8.5 |
| R10 | 20.5 | 13.6 | 9.0 | 18.2 | 13.3 | 8.8 |

6.2 The baseline assessment for Scenario 2 and 3 indicates that predicted concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ are all below the current respective annual mean air quality objectives for England at all existing receptor locations considered.

## Impact Assessment

Detailed Operational Phase Road Traffic Emissions Assessment

6.3 Concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were predicted at identified existing receptor locations for Scenario 4: 2025 Opening Year with development, to consider the impact of development-generated vehicles on local air quality.

6.4 Predicted pollutant concentrations are detailed in **Table 6.2**, **Table 6.3** and **Table 6.4** for $NO_2$, $PM_{10}$ and $PM_{2.5}$ respectively together with Scenario 3: 2025 Opening Year without development concentrations for comparison purposes. The predicted change in pollutant concentrations resulting from development-generated traffic, and the associated impact are also provided.

**Table 6.2: Predicted Annual Mean $NO_2$ Concentrations and Development Impact at Existing Receptor Locations**

| Receptor | Predicted $NO_2$ Concentration ($\mu g.m^{-3}$) | | | | |
|---|---|---|---|---|---|
| | Scenario 3: 2025 Without Development ($\mu g.m^{-3}$) | Scenario 4: 2025 With Development ($\mu g.m^{-3}$) | Concentration Change* ($\mu g.m^{-3}$) | Change in Concentration Relative to Air Quality Assessment Level (%) | Impact |
| R1 | 17.4 | 17.5 | +0.1 | 0 | Negligible |
| R2 | 17.9 | 18.0 | +0.1 | 0 | Negligible |
| R3 | 17.2 | 17.3 | +0.1 | 0 | Negligible |
| R4 | 20.8 | 21.0 | +0.1 | 0 | Negligible |
| R5 | 19.2 | 19.3 | +0.1 | 0 | Negligible |
| R6 | 16.6 | 16.6 | 0.0 | 0 | Negligible |
| R7 | 16.5 | 16.6 | +0.1 | 0 | Negligible |
| R8 | 16.6 | 16.7 | 0.1 | 0 | Negligible |
| R9 | 16.8 | 16.8 | 0.0 | 0 | Negligible |
| R10 | 18.2 | 18.2 | 0.0 | 0 | Negligible |

** Discrepancies in changes due to rounding effects*

**Table 6.3: Predicted Annual Mean $PM_{10}$ Concentrations and Development Impact at Existing Receptor Locations**

| Receptor | Predicted $PM_{10}$ Concentration ($\mu g.m^{-3}$) | | | | |
|---|---|---|---|---|---|
| | Scenario 3: 2025 Without Development ($\mu g.m^{-3}$) | Scenario 4: 2025 With Development ($\mu g.m^{-3}$) | Concentration Change* ($\mu g.m^{-3}$) | Change in Concentration Relative to Air Quality Assessment Level (%) | Impact |
| R1 | 12.9 | 12.9 | 0.0 | 0 | Negligible |
| R2 | 13.1 | 13.1 | 0.0 | 0 | Negligible |
| R3 | 12.9 | 12.9 | 0.0 | 0 | Negligible |
| R4 | 14.1 | 14.1 | 0.0 | 0 | Negligible |
| R5 | 13.7 | 13.7 | 0.0 | 0 | Negligible |
| R6 | 12.3 | 12.3 | 0.0 | 0 | Negligible |
| R7 | 12.7 | 12.7 | 0.0 | 0 | Negligible |
| R8 | 12.7 | 12.7 | 0.0 | 0 | Negligible |
| R9 | 12.8 | 12.8 | 0.0 | 0 | Negligible |
| R10 | 13.3 | 13.3 | 0.0 | 0 | Negligible |

** Discrepancies in changes due to rounding effects*

**Table 6.4: Predicted Annual Mean $PM_{2.5}$ Concentrations and Development Impact at Existing Receptor Locations**

| Receptor | Predicted $PM_{2.5}$ Concentration ($\mu g.m^{-3}$) | | | | |
|---|---|---|---|---|---|
| | Scenario 3: 2025 Without Development ($\mu g.m^{-3}$) | Scenario 4: 2025 With Development ($\mu g.m^{-3}$) | Concentration Change* ($\mu g.m^{-3}$) | Change in Concentration Relative to Air Quality Assessment Level (%) | Impact |
| R1 | 8.6 | 8.6 | 0.0 | 0 | Negligible |
| R2 | 8.7 | 8.7 | 0.0 | 0 | Negligible |
| R3 | 8.6 | 8.6 | 0.0 | 0 | Negligible |

| Receptor | Predicted $PM_{2.5}$ Concentration ($\mu g.m^{-3}$) | | | | |
|---|---|---|---|---|---|
| | Scenario 3: 2025 Without Development ($\mu g.m^{-3}$) | Scenario 4: 2025 With Development ($\mu g.m^{-3}$) | Concentration Change* ($\mu g.m^{-3}$) | Change in Concentration Relative to Air Quality Assessment Level (%) | Impact |
| R4 | 9.2 | 9.3 | 0.0 | 0 | Negligible |
| R5 | 9.0 | 9.0 | 0.0 | 0 | Negligible |
| R6 | 8.1 | 8.1 | 0.0 | 0 | Negligible |
| R7 | 8.4 | 8.5 | 0.0 | 0 | Negligible |
| R8 | 8.5 | 8.5 | 0.0 | 0 | Negligible |
| R9 | 8.5 | 8.5 | 0.0 | 0 | Negligible |
| R10 | 8.8 | 8.8 | 0.0 | 0 | Negligible |

** Discrepancies in changes due to rounding effects*

6.5 The predicted $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations for Scenario 3 and Scenario 4 are all below the current relevant annual mean air quality objectives for England at all sensitive receptor locations considered. Furthermore, predicted $PM_{2.5}$ concentrations at all sensitive receptor locations were below the interim annual mean target of 12 $\mu g.m^{-3}$ and the future annual mean air quality objective of 10 $\mu g.m^{-3}$.

6.6 The proposed development does not lead to any exceedances of the current relevant annual mean air quality objectives and the predicted changes in $NO_2$, $PM_{10}$ and $PM_{2.5}$ concentrations are less than 1% of the current relevant annual mean air quality objectives. Impacts are therefore considered to be negligible, in accordance with the IAQM and EPUK guidance[14], at all sensitive existing receptor locations considered within the assessment.

6.7 With regard to short term air quality objectives for $NO_2$ and $PM_{10}$, the predicted annual mean $NO_2$ concentrations are less than 60$\mu g.m^{-3}$ and therefore in accordance with Defra guidance[12] it may be assumed that exceedance of the current relevant 1-hour mean $NO_2$ air quality objective is unlikely. The calculation detailed in paragraph 3.17 was used to determine potential exceedance of the 24-hour $PM_{10}$ short term objective; no exceedances were predicted.

## Impact Significance Summary

6.8 Relevant guidance, legislation and professional judgement was utilised to determine the significance of the findings of the air quality assessment. The air quality assessment

was undertaken by a full member of the Institute of Air Quality Management. A summary of the impact significance and justification of this are provided below.

6.9 The impact of the proposed development on air quality is considered to be 'negligible':

- Consideration was given to local planning policy[11] and the development proposals are considered to be in accordance with this policy with regard to air quality.
- Existing concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ in the study area are predicted to be below the current relevant long term and short term air quality objectives.
- The air quality assessment undertaken utilised robust model inputs including robust traffic data assumptions, model inputs including slowing traffic at junctions and appropriate meteorological inputs and surface roughness.
- The impact of development-generated road traffic on local air quality is defined as negligible in accordance with IAQM and EPUK guidance[14].

**Site Suitability Assessment**

6.10 Concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were predicted across the Site to determine the suitability of the Site for the proposed residential use with regard to air quality.

6.11 A Cartesian grid from minimum X 386043, Y 395656 to maximum X 386254, Y 395872 was modelled at a height of 1.5m to represent average breathing height at ground floor across the Site. Pollutant concentrations were predicted for Scenario 4: 2025 Opening Year with the proposed development in place. **Figures 6.1 – 6.3** illustrate annual mean pollutant concentration contours for $NO_2$, $PM_{10}$ and $PM_{2.5}$, respectively, across the Site.

**Figure 6.1: Predicted Annual Mean $NO_2$ Concentrations Across the Site**

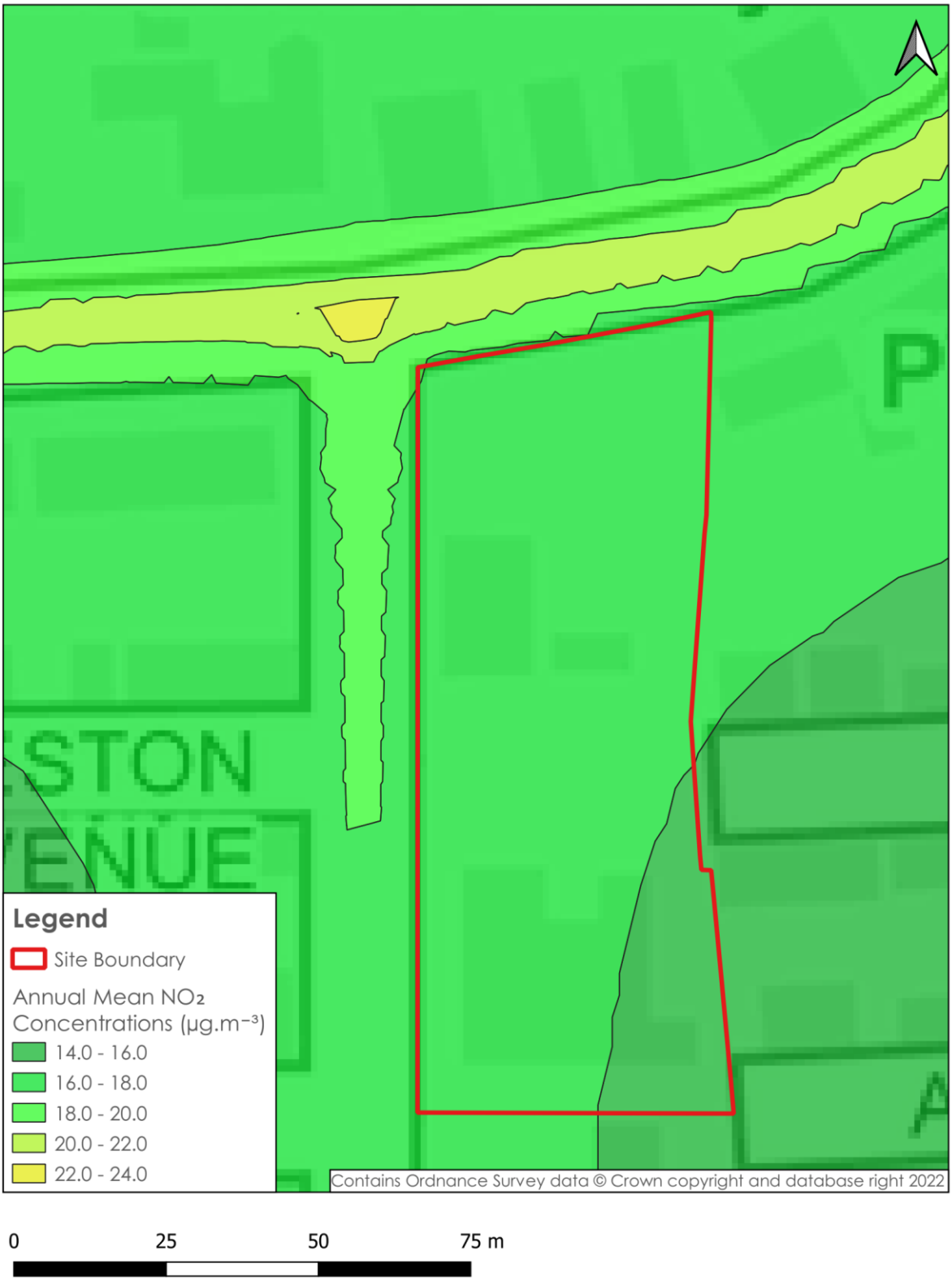


**Figure 6.1: Predicted Annual Mean $NO_2$ Concentrations Across the Site**

Drawn by: BR
Date: 27/10/2022

**Figure 6.2: Predicted Annual Mean $PM_{10}$ Concentrations Across the Site**

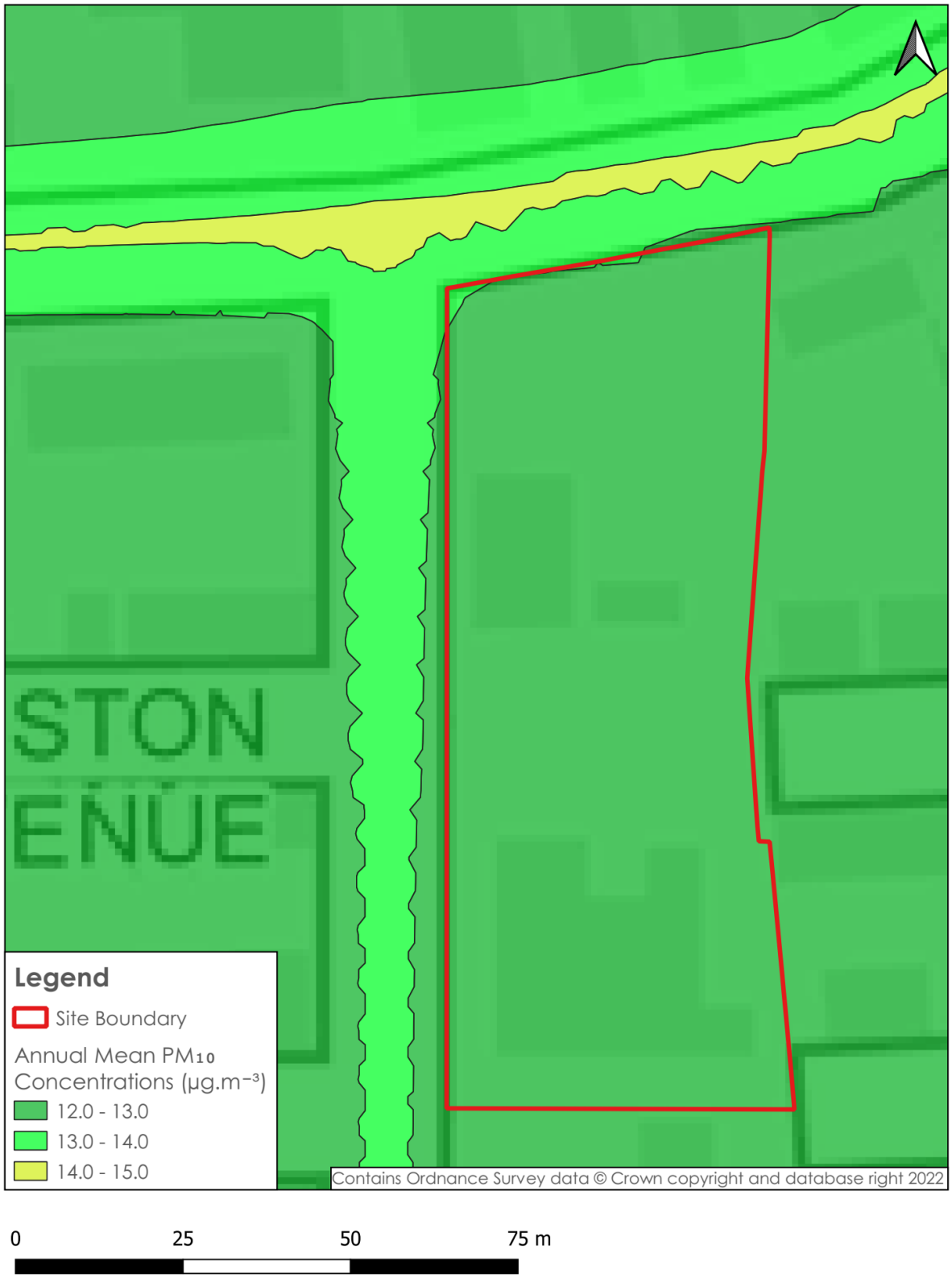


**Figure 6.2: Predicted Annual Mean $PM_{10}$ Concentrations Across the Site**

Drawn by: BR
Date: 27/10/2022

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**Figure 6.3: Predicted Annual Mean $PM_{2.5}$ Concentrations Across the Site**

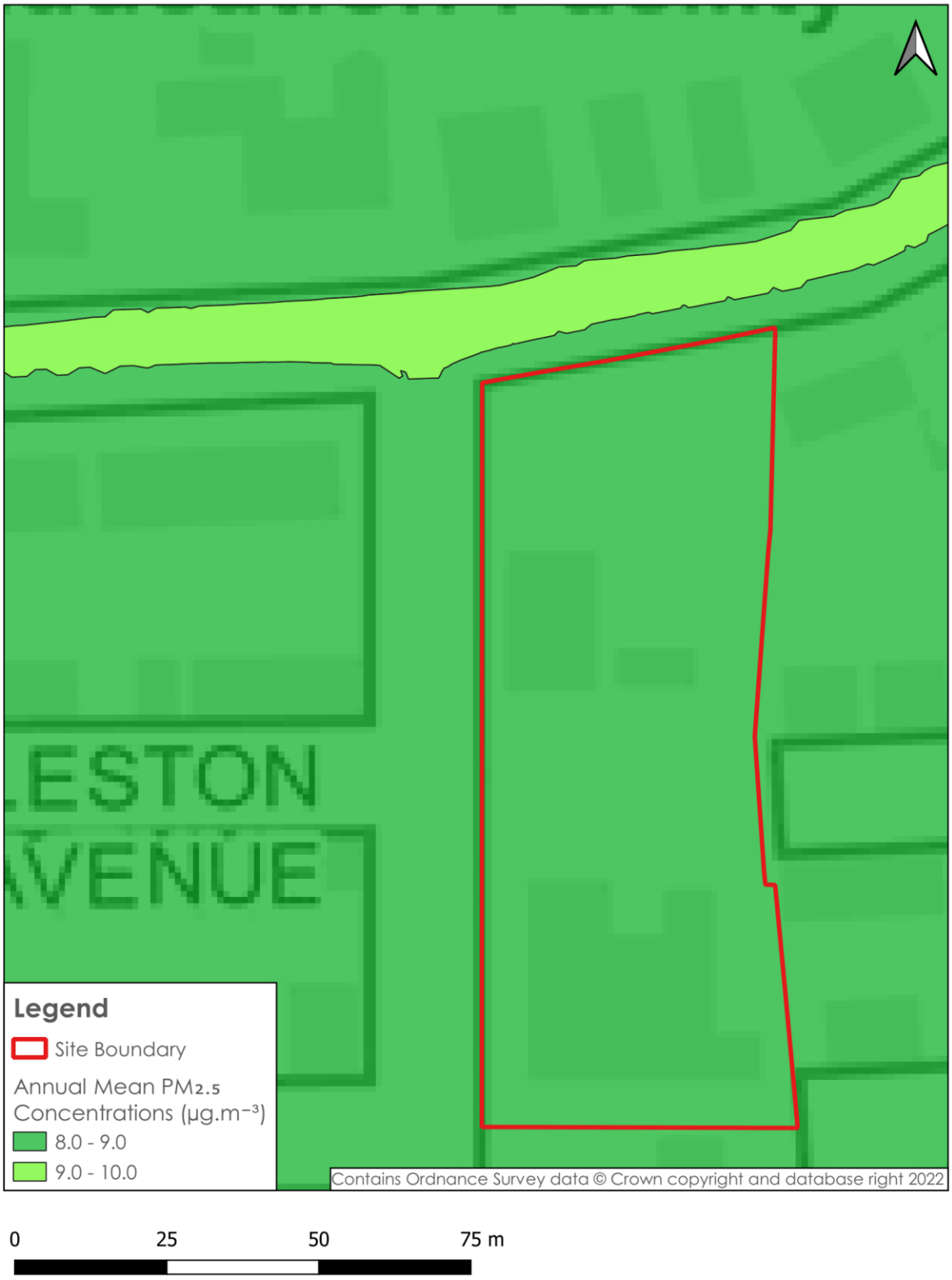


**Figure 6.3: Predicted Annual Mean $PM_{2.5}$ Concentrations Across the Site**

Drawn by: BR
Date: 27/10/2022

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6.12 The predicted $NO_2$, $PM_{10}$ and $PM_{2.5}$ annual mean concentrations for Scenario 4: 2025 Opening Year were all below the current relevant air quality objectives for England across the Site. Furthermore, predicted $PM_{2.5}$ concentrations were also below the interim and future $PM_{2.5}$ annual mean air quality objectives. Therefore, the Site is considered to be suitable for the proposed residential use with regard to the current air quality objectives.

6.13 With regard to short term air quality objectives for $NO_2$ and $PM_{10}$ at the residential development, the predicted annual mean $NO_2$ concentrations are less than 60µg.m$^{-3}$ and therefore in accordance with Defra guidance[12] it may be assumed that exceedance of the 1-hour mean $NO_2$ objective are unlikely. The calculation detailed in paragraph 3.17 was used to determine potential exceedance of the 24-hour $PM_{10}$ short term objective; no exceedances were predicted.

### Mitigation

6.14 The development will result in minimal increases in pollutant concentrations and no new exceedances of the relevant air quality objectives are predicted. No mitigation measures are therefore required to minimise development-generated road traffic emissions.

6.15 Measures included within the scheme which may be beneficial to air quality include the 100% EV charging provision for the proposed houses and 20% EV charging provision and infrastructure for the apartment courtyard parking area. Cycle parking is also proposed at a ratio of 1:1 spaces to apartments and houses. A Travel Plan will also be submitted in support of the planning application for the proposed development and includes the following initiatives:

- Appointment of a Travel Plan Coordinator;
- Provision of travel information in resident welcome packs;
- Measures to encourage active travel; and
- Measures to encourage the use of public transport and car sharing.

# 7. CONCLUSION

7.1 An air quality assessment was undertaken for the proposed residential development, at land associated with the former Victoria Park Probation Centre, off Laindon Road, Manchester.

7.2 A qualitative construction phase assessment was undertaken and measures were recommended to minimise emissions during construction activities. With the implementation of these mitigation measures the impact of construction phase dust emissions is considered to be 'not significant' in accordance with IAQM guidance[13].

7.3 A detailed road traffic emissions assessment was undertaken to consider the impact of development-generated road traffic on local air quality at identified existing receptor locations. Road traffic emissions were modelled using the dispersion model ADMS-Roads and concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were predicted at identified sensitive receptor locations. The modelling assessment was undertaken in accordance with Defra Local Air Quality Management Technical Guidance[12]. The development was not predicted to result in any new exceedances of the current relevant air quality objectives and the impact of the development on local air quality was predicted to be 'negligible' in accordance with IAQM and EPUK guidance[14].

7.4 Pollutant concentrations were also predicted across the proposed development Site. Concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were all predicted to be below the current relevant air quality objectives and therefore the Site was considered to be suitable for the proposed residential use with regard to air quality.

7.5 Based on the assessment results, mitigation measures are not required for air quality reasons. However measures which may be beneficial to local air quality were incorporated into the Framework Travel Plan to minimise emissions associated with the operation of the proposed development. Measures include the provision of EV charging and cycle parking.

# *APPENDICES*

# APPENDIX A: GLOSSARY OF TERMS

| Term | Definition |
|---|---|
| AADT | Annual Average Daily Traffic flow. |
| Air quality objective | Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard). |
| Air quality standard | 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 the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective). |
| Annual mean | The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between two years, which is useful for pollutants that have higher concentrations during the winter months. |
| AQAP | Air Quality Action Plan. |
| AQMA | Air Quality Management Area. |
| AQS | Air Quality Strategy. |
| Defra | Department for Environment, Food and Rural Affairs. |
| EPUK | Environmental Protection UK. |
| Exceedance | A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard. |
| HDV | Heavy Duty Vehicles (HGVs + buses and coaches) |
| HGV | Heavy Goods Vehicles. |
| IAQM | Institute of Air Quality Management. |
| LAQM | Local Air Quality Management. |
| LDV | Light Duty Vehicles (motorbikes, cars, vans and small trucks) |
| NO | Nitrogen monoxide, a.k.a. nitric oxide. |
| $NO_2$ | Nitrogen dioxide. |
| $NO_x$ | Nitrogen oxides. |
| Percentile | The percentage of results below a given value. |
| $PM_{10}$ | Particulate matter with an aerodynamic diameter of less than 10 micrometres. |
| $PM_{2.5}$ | Particulate matter with an aerodynamic diameter of less than 2.5 micrometres. |
| micrograms per cubic metre ($\mu g.m^{-3}$) | 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 pollutant. |

# APPENDIX B: PROPOSED DEVELOPMENT MASTERPLAN

**EXISTING PLAN**
1:200 @ A1

**PLANNING**

0 5 10 15 20 25 M

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IMPORTANT NOTES:

| REVISION | DATE | DESCRIPTION |
|---|---|---|

CLIENT: BRITTANIA GROUP
PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT
ADDRESS: VICORIA PARK PROBATION CENTRE
DRAWING TITLE: EXISTING PLAN
SCALE: 1:200 @ A1 DATE: JULY 2022
DRAWING NO: A662_P_015

**OLLIER SMURTHWAITE** ARCHITECTS
40 King Street, Manchester, M2 6BA
T 0161 883 0838
F 0161 883 0839
E mail@olliersmurthwaite.com

# APPENDIX C: PLANNING POLICY AND LEGISLATION

## National Legislation and Planning Policy

### The UK Air Quality Strategy

European Union (EU) legislation forms the basis of air quality policy and legislation in the UK. The EU 2008 ambient Air Quality Directive[1] sets limits for ambient concentrations of air pollutants including nitrogen dioxide ($NO_2$) and particulate matter ($PM_{10}$ and $PM_{2.5}$). The air quality standards and objectives are prescribed through the Air Quality (England) Regulations 2000[2], as amended, for the purpose of the Local Air Quality Management Framework.

The UK Government are required under the Environment Act 1995[3] to produce a national Air Quality Strategy (AQS). The AQS was first published in 1997[6] and was most recently reviewed and updated in 2007[7] with miscellaneous amendments added in 2020[8]. The AQS provides an overview of the Government's ambient air quality policy and sets out the air quality standards and objectives to be achieved and measures to improve air quality.

The Environment Act 2021[4] was granted Royal Assent in November 2021 and contains amendments to Part IV of the Environment Act 1995[3] with regard to the Local Air Quality Management regime. Under the Environment Act 2021[4], the Secretary of State must lay a statement before Parliament setting out progress made in meeting air quality objectives and standard in England and steps taken towards achieving the standards. The Environment Act 2021[4] also places responsibility on local authorities to co-operate with air quality partners in the preparation of Air Quality Action Plans and identification of measures which should be monitored within the Plan and dates by which they should be implemented.

Part IV of the Environment Act[3] requires local authorities in the UK to review local air quality within their administrative area and, if relevant air quality standards and objectives are likely to be exceeded, designate Air Quality Management Areas (AQMAs). Following the designation of an AQMA, local authorities are required to publish an Air Quality Action Plan (AQAP) detailing measures to be taken to improve local air quality and work towards meeting the relevant air quality standards and objectives.

### National Planning Policy Framework

The National Planning Policy Framework (NPPF)[6] was amended in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied.

The NPPF[6] recognises air quality within Section 15: Conserving and enhancing the natural environment, and states that:

> *"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;*

*[…]*

*Ground conditions and pollution*

*[…]*

*Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*
*[…]*
*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."*

With regard to assessing cumulative effects the NPPF[6] states:

*"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.*

*[...]"*

## Planning Practice Guidance

The Planning Practice Guidance (PPG) for air quality[7] was updated in November 2019 and provides guiding principles on how the planning process can take account of the impacts of new development on air quality.

The PPG[7] sets out the following with regard to air quality and planning:

- *"What air quality considerations does planning need to address;*
- *What is the role of plan-making with regard to air quality;*
- *Air quality concerns relevant to neighbourhood planning;*
- *What information is available about air quality;*

- *When could air quality considerations be relevant to the development management process;*
- *What specific issues may need to be considered when assessing air quality impacts;*
- *How detailed does an air quality assessment need to be; and*
- *How can an impact on air quality be mitigated".*

The PPG[7] sets out the pollutants for which there are legally binding limits for concentrations and those which the UK also has national emissions reduction commitments.

The PPG[7] states that development plans may need to consider:

- *"what are the observed trends shown by recent air quality monitoring data and what would happen to these trends in light of proposed development and / or allocations;*
- *the impact of point sources of air pollution (pollution that originates from one place);*
- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments, including their implications for vehicle emissions;*
- *ways in which new development could be made appropriate in locations where air quality is or is likely to be a concern, and not give rise to unacceptable risks from pollution. This could, for example, entail identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable; and*
- *opportunities to improve air quality or mitigate impacts, such as through traffic and travel management and green infrastructure provision and enhancement".*

The PPG[7] also states what may be considered relevant to determining a planning application and these include whether a development would:

- *"Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or*

*extraction systems (including chimneys) which require approval or permits under pollution control legislation;*

- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*
- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations;*
- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value".*

The PPG[7] provides guidance regarding what should be included within an air quality assessment. Examples of potential air quality mitigation measures are also provided.

## Local Planning Policy

### Manchester's Local Development Framework: Core Strategy Development Plan Document

*"Policy CC 5*

*Transport*

*[…]*

*Proposals will be supported that improve pedestrian safety, improve air quality and increase the scope for accessible public realm improvements.*

*[…]*

*Policy T 1*

*Sustainable Transport*

*To deliver a sustainable, high quality, integrated transport system to encourage modal shift away from car travel to public transport, cycling and walking, to support the needs of residents and businesses and to prepare for carbon free modes of transport, the Council will support proposals that:-*

*[…]*

*Would reduce the negative impacts of road traffic for example, congestion, air pollution and road traffic accident casualties.*

*[…]*

*Policy EN 16*

*Air Quality*

*The Council will seek to improve the air quality within Manchester and particularly within Air Quality Management Areas, located along Manchester's principal traffic routes and at Manchester Airport. Developers*

*will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.*

*When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas*

*[…]*

*Policy DM 1*

*Development Management*

*All development should have regard to the following specific issues for which more detailed guidance may be given within the supplementary planning document:-*

*Effects on amenity, including privacy, light, noise vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise."*

The above policies were taken into consideration throughout the undertaking of the assessment.

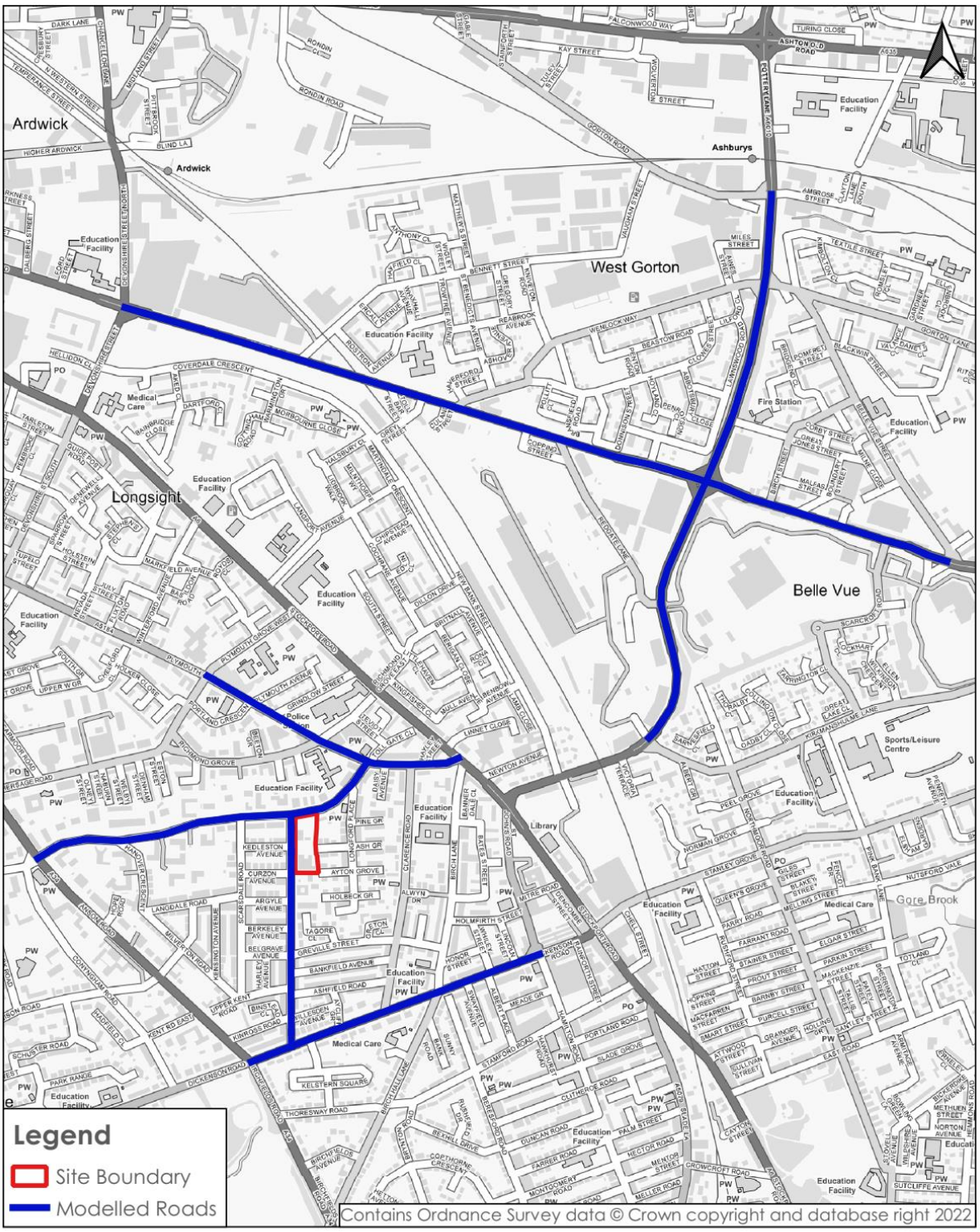
# APPENDIX D: TRAFFIC DATA UTILISED IN THE AIR QUALITY ASSESSMENT

**Table D1: Traffic Data Utilised in the Air Dispersion Modelling Assessment**

| Road Link | Speed | Scenario 1: 2019 Verification Year | | Scenario 2: 2022 Base Year | | Scenario 3: 2025 Opening Year Without Development | | Scenario 4: 2025 Opening Year With Development | |
|---|---|---|---|---|---|---|---|---|---|
| | Km.hr$^{-1}$ | 24 hour AADT Total Flow | HDV Flow | 24 hour AADT Total Flow | HDV Flow | 24 hour AADT Total Flow | HDV Flow | 24 hour AADT Total Flow | HDV Flow |
| A6010 Pottery Lane north of A57 | 48 | 26,652 | 977 | 28,049 | 1,028 | 30,795 | 1,129 | 30,821 | 1,129 |
| A57 Hyde Road west of A6010 | 48 | 18,305 | 898 | 19,264 | 945 | 21,150 | 1,038 | 21,150 | 1,038 |
| A57 Hyde Road east of A6010 | 48 | 23,158 | 1,071 | 24,371 | 1,127 | 26,757 | 1,237 | 26,779 | 1,237 |
| A6010 south of A57 | 48 | 18,315 | 345 | 19,275 | 363 | 21,162 | 399 | 21,209 | 399 |
| Laindon Road north of access | 32 | 1,392 | 13 | 1,458 | 14 | 1,587 | 15 | 1,846 | 15 |
| Laindon Road south of access | 32 | 1.392 | 13 | 1,458 | 14 | 1,587 | 15 | 1,700 | 15 |
| Daisy Bank Road west of Laindon Road | 32 | 3,537 | 60 | 3,705 | 63 | 4,033 | 68 | 4,077 | 68 |
| Daisy Bank Road east of Laindon Road | 32 | 3,537 | 60 | 3,705 | 63 | 4,033 | 68 | 4,248 | 68 |
| A5184 Plymouth Grove north west of Daisy Bank Road | 48 | 9,979 | 182 | 10,453 | 191 | 11,378 | 208 | 11,504 | 208 |
| A5184 Plymouth Grove east of Daisy Bank Road | 48 | 9,979 | 182 | 10,453 | 191 | 11,378 | 208 | 11,467 | 208 |
| A6010 Dickenson Road west of Laindon Road | 48 | 8,897 | 109 | 9,320 | 114 | 10,144 | 124 | 10,248 | 124 |
| A6010 Dickenson Road east of Laindon Road | 48 | 10,275 | 146 | 10,763 | 153 | 11,716 | 166 | 11,724 | 166 |

An illustration of the road links included in the ADMS-Roads model is provided in **Figure D1**.

## Figure D1: Road Links Included in the ADMS-Roads Model




0 0.5 1 1.5 km

**Figure D1: Road Links Included in the ADMS-Roads Model**

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Date: 26/10/2022

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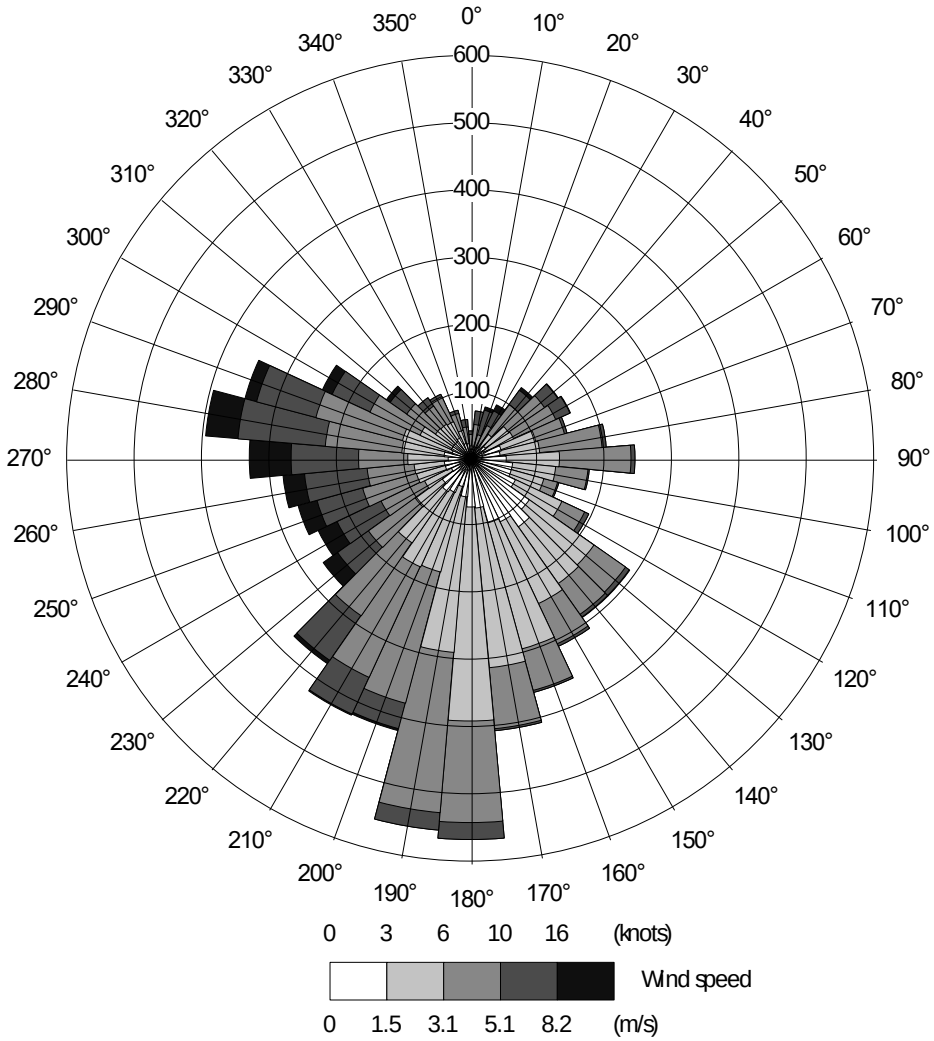
# APPENDIX E: WIND ROSE FOR 2019 FOR MANCHESTER AIRPORT METEOROLOGICAL RECORDING STATION

Meteorological data for 2019 Verification Year scenario for the Manchester Airport recording station was obtained for use in the air dispersion modelling assessment. The wind rose for 2019 is detailed below and illustrates a predominant wind direction from the south with additional influence from the west.



# APPENDIX F: MODEL VERIFICATION

Whilst ADMS-Roads is widely validated for use in this type of assessment, model verification for the area around the Site will not have been included. To determine model performance at a local level, a comparison of modelled results with monitored results in the study area was done in accordance with the methodology provided by Defra. This process of verification aims to minimise modelling uncertainty by correcting modelled results by an adjustment factor to give greater confidence to the results.

The model was run for Scenario 1: 2019 Verification Year to predict the 2019 annual mean road contributions of NOx at the monitoring locations within the study area. The modelled NOx outputs at these locations were compared to the 2019 monitored concentrations to provide an adjustment factor. **Table F1** presents the verification process for NOx respectively and **Figure F1** details the monitoring locations utilised in the model verification.

**Table F1: NOx Verification Process**

| Model Verification Steps | MA86ANO | MA87ANO | MA88ANO |
|---|---|---|---|
| 2019 monitored total $NO_2$ ($\mu g.m^{-3}$) | 33.6 | 34.0 | 43.3 |
| 2019 background $NO_2$ concentration ($\mu g.m^{-3}$) | 18.6 | 19.0 | 19.0 |
| Monitored road contribution NOx ($\mu g.m^{-3}$) | 29.9 | 29.9 | 50.7 |
| Modelled road contribution NOx ($\mu g.m^{-3}$) | 12.3 | 11.9 | 10.8 |
| Ratio of monitored road NOx to modelled road NOx | 2.4 | 2.5 | 4.7 |
| **Adjustment factor for modelled road contribution NOx** | **3.1007** | | |
| Adjusted modelled road contribution NOx ($\mu g.m^{-3}$) | 38.2 | 36.9 | 33.4 |
| Modelled total $NO_2$ concentration ($\mu g.m^{-3}$) | 37.5 | 37.2 | 35.6 |
| Monitored total $NO_2$ concentration ($\mu g.m^{-3}$) | 33.6 | 34.0 | 43.3 |
| % difference between modelled and monitored total $NO_2$ concentration | 10.3 | 8.7 | -21.6 |
| RMSE % (should be less than 25% and ideally less than 10%) | 13.2 | | |

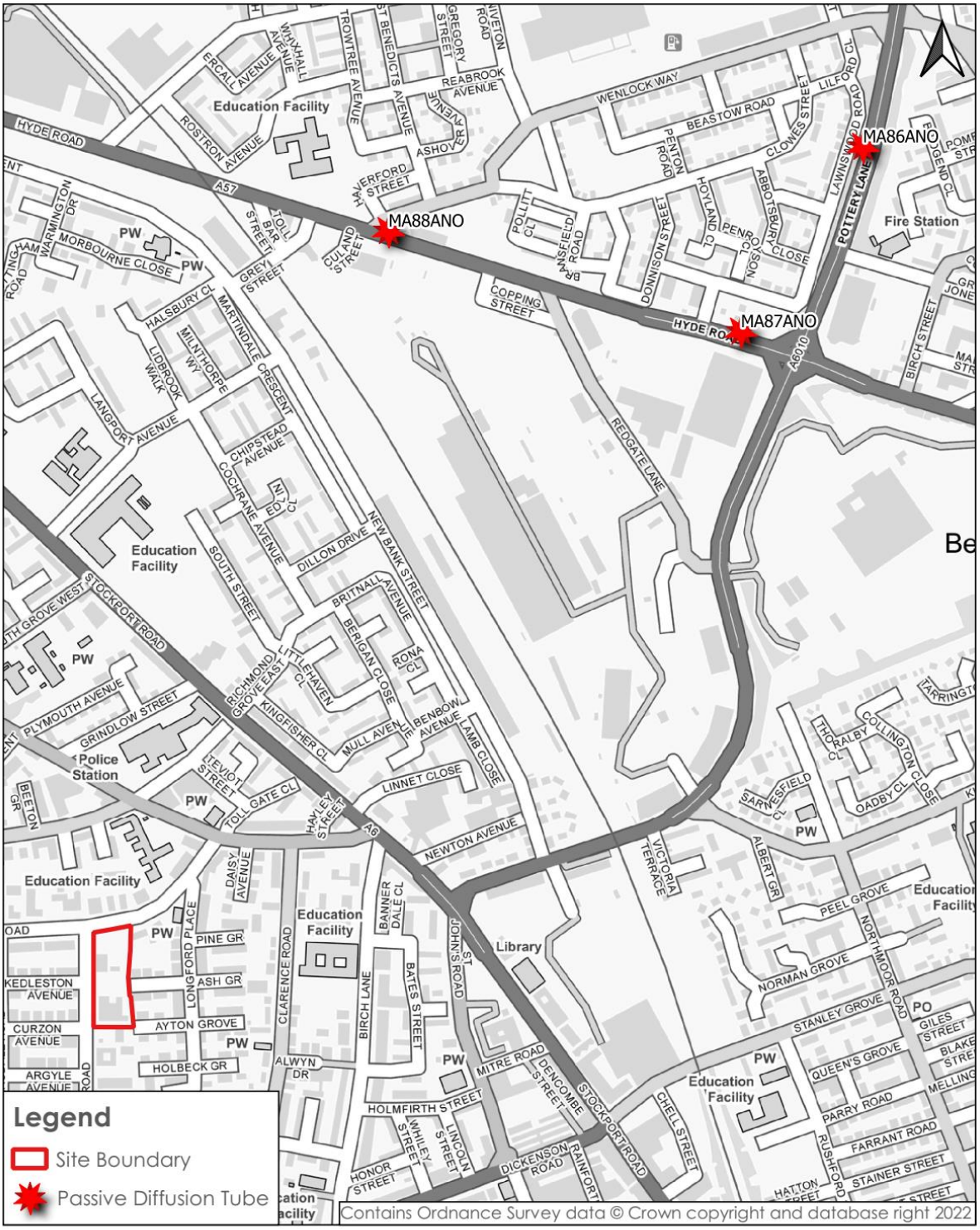
** Road-NOx component, determined from NOx to $NO_2$ calculator*

A road-NOx factor of **3.1007** was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero. This factor was then applied to the modelled road-NOx concentrations at each existing receptor and across the Site, before conversion to $NO_2$ concentrations using the $NO_x$ to $NO_2$ calculator provided by Defra and the $NO_2$ background concentration.

Statistical analysis undertaken for the results in **Table F1** demonstrate that the RMSE is within the acceptable range. Given the number of monitoring sites in the study area and the extent of the modelled road network, the RMSE value is considered to represent an acceptable level of average uncertainty within the air quality model.

No monitoring of $PM_{10}$ or $PM_{2.5}$ is undertaken within the study area. Therefore the adjustment factor calculated during the NOx verification process was utilised to adjust predicted concentrations of $PM_{10}$ and $PM_{2.5}$.

## Figure F1: Monitoring Locations Utilised in the ADMS-Roads Model Verification Process




0 250 500 750 m

**Figure F1: Monitoring Locations Utilised in the ADMS-Roads Model Verification Process**

Drawn by: BR
Date: 26/10/2022

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