

Air Quality Assessment

Leigh Road, Eastleigh

Prepared on behalf of:

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Executive Summary

Build Energy was commissioned by Morgan Sindall Construction & Infrastructure Ltd to undertake an Air Quality Assessment in support of a planning application for a new Fire Training Facility on land off Leigh Road, Eastleigh.

It is proposed to redevelop the existing Academy Building and Fire Training Facility at Hampshire Fire and Rescue Headquarters, Leigh Road, Eastleigh. A pre-application response (Ref: Q/20/87536) from Eastleigh Borough Council raised concerns that atmospheric emissions associated with the operation of the Fire Training Facility may cause air quality impacts at sensitive locations in the vicinity of the site. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and quantify potential effects.

Dispersion modelling was undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the Fire Training Facility. The results indicated that impacts on pollutant concentrations were not predicted to be significant at any human receptor location in the vicinity of the site.

Impacts were also predicted at relevant ecological sites. The results indicated that emissions from the Fire Training Facility would not significantly affect existing conditions at any designation.

Based on the assessment results, air quality impacts are not considered a constraint to planning consent for the development.

Introduction

Background

Build Energy was commissioned by Morgan Sindall Construction & Infrastructure Ltd to undertake an Air Quality Assessment in support of a planning application for a new Fire Training Facility on land off Leigh Road, Eastleigh.

It is proposed to redevelop the existing Academy Building and Fire Training Facility at Hampshire Fire and Rescue Headquarters, Leigh Road, Eastleigh. A pre-application response from Eastleigh Borough Council (EBC) raised concerns that atmospheric emissions associated with the operation of the Fire Training Facility may cause air quality impacts at sensitive locations in the vicinity of the site. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and quantify potential effects.

Site Location and Context

The site is located on land off Leigh Road, Eastleigh, at approximate National Grid Reference (NGR): 444225, 119625. Reference should be made to Figure 1 for a map of the site and surrounding area.

It is proposed to operate the Fire Training Facility for up to 3-hours a day, for a maximum of 6-days per week. Approximately 360kg of Oriented Strand Board (OSB) will be burnt per hour of operation to produce smoke for training purposes. Emissions will be contained by an internal ventilation system prior to release at a height of 12m via a dispersion stack.

The operation of the Fire Training Facility will result in atmospheric emissions from the combustion of solid fuel. These have the potential to cause air quality impacts at sensitive locations within the vicinity of the site. As such, potential effects have been assessed within the following report.

Legislation and Policy

Legislation

The Air Quality Standards Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO₂);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm (PM₁₀);
- Particulate matter with an aerodynamic diameter of less than 2.5µm;
- Benzene; and,
- Carbon monoxide (CO).

Target values have also been provided for several additional pollutants.

The Air Quality Strategy (AQS) was produced by DEFRA and published in July 2007¹. The document contains standards, objectives and measures for improving ambient air quality, including a number of Air Quality Objectives (AQOs). These are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m ³)	Averaging Period
NO ₂	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
PM ₁₀	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum
CO	10,000	8-hour rolling mean

Table 2 summarises the advice provided in DEFRA guidance² on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objective Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence

¹ The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

² Local Air Quality Management Technical Guidance (TG22), DEFRA, 2022.

24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels	Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term Kerbside sites (as opposed to locations at the building façade) or any other location where public exposure is expected to be short term
1-hour mean	Gardens of residential properties All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

Local Air Quality Management

Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure, as summarised in Table 2, are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

Critical Loads and Levels

A critical load is defined by the UK Air Pollution Information System (APIS)³ as:

"A quantitative estimate of exposure to deposition of one or more pollutants below which significant harmful effects on sensitive elements of the environment do not occur according to present knowledge."

A critical level is defined as:

"Concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge."

A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedence. A larger exceedence is often considered to represent a greater risk of damage.

Maps of critical loads and levels and their exceedences have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is

³ UK Air Pollution Information System, www.apis.ac.uk.

seen as means for preventing the risk of damage. However, even a decrease in the exceedence may infer that less damage will occur.

Table 3 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 3 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Period
Oxides of nitrogen (NO_x)	30	Annual mean
	75	24-hour mean

Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been identified for the relevant designations considered in the assessment.

National Planning Policy

The revised National Planning Policy Framework⁴ (NPPF) was published in July 2021 and sets out the Government's planning policies for England and how these are expected to be applied.

The purpose of the planning system is to contribute to the achievement of sustainable development. In order to ensure this, the NPPF recognises three overarching objectives including the following of relevance to air quality:

"c) An environmental objective - to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."

Chapter 15 of the NPPF details objectives in relation to conserving and enhancing the natural environment. It 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 [...]."

The NPPF specifically recognises air quality as part of delivering sustainable development and states that:

"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."

⁴ NPPF, Ministry of Housing, Communities and Local Government, 2021.

The implications of the NPPF have been considered throughout this assessment.

National Planning Practice Guidance

The National Planning Practice Guidance⁵ (NPPG) web-based resource was launched by the Department for Communities and Local Government on 6th March 2014 and updated on 1st November 2019 to support the NPPF and make it more accessible. The air quality pages are summarised under the following headings:

1. What air quality considerations does planning need to address?
2. What is the role of plan-making with regard to air quality?
3. Are air quality concerns relevant to neighbourhood planning?
4. What information is available about air quality?
5. When could air quality considerations be relevant to the development management process?
6. What specific issues may need to be considered when assessing air quality impacts?
7. How detailed does an air quality assessment need to be?
8. How can an impact on air quality be mitigated?

These were reviewed and the relevant guidance considered as necessary throughout the undertaking of this assessment.

Local Planning Policy

The Eastleigh Borough Local Plan 2016 - 2036⁶ was adopted by EBC in April 2022. Review of the document identified the following policy of relevance to this report:

"Policy DM8, Pollution

Development will not be permitted if it is likely to cause loss of amenity or impact on public health or other unacceptable environmental impacts through:

a. air pollution (including odours or particulate emissions)

[...]

Development susceptible to particular forms of pollution will not be permitted:

- a. where it will be adversely affected by such pollution, unless measures can be taken that adequately mitigate the polluting effects; or
- b. where it would inhibit existing economic or other activities giving rise to acceptable polluting effects.

[...]."

The above policy has been taken into consideration throughout the assessment.

⁵ <https://www.gov.uk/guidance/air-quality--3>.

⁶ Eastleigh Borough Local Plan 2016 - 2036, EBC, 2022.

Baseline

Introduction

Existing air quality conditions in the vicinity of the development were identified in order to provide a baseline for the assessment. These are detailed in the following Sections.

Local Air Quality Management

As required by the Environment Act (1995), EBC has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that annual mean NO₂ concentrations are above the relevant AQO within the borough. Four AQMAs have therefore been declared. The closest to the site is described as follows:

"Eastleigh AQMA No.1 (A335) - The AQMA encompasses an area extending 30m to either side of the A335 from the junction of Leigh Road and Bournemouth Road to Wide Lane (north of the roundabout with the M27 spur)"

The development is located approximately 140m from the AQMA. As such, there is the potential for emissions from the development to increase pollutant concentrations in this sensitive area. This has been taken into consideration throughout the assessment.

EBC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

Air Quality Monitoring

Monitoring of pollutant concentrations is undertaken by EBC throughout their area of jurisdiction. Recent NO₂ results recorded in the vicinity of the development are shown in Table 4. Exceedences of the relevant AQO are shown in **bold**.

Table 4 NO₂ Monitoring Results

Monitoring Site		Monitored NO ₂ Concentration (µg/m ³)		
		2018	2019	2020
LRPR	Leigh Road / Pluto Road	32.90	31.60	23.94
OX	Oxburgh Close	20.07	18.63	15.81
WA	Woodside Avenue	34.97	31.45	26.03
SC(A)	Steele Close	24.11	22.57	18.03
SC(B)	Steele Close	25.67	23.00	_(a)
SC(C)	Steele Close	25.40	22.46	_(a)
BEL	Belmont Road	26.01	24.35	20.77
LR13	Leigh Road / Junction 13	41.41	39.03	30.69
MC	Medina Close	26.38	24.39	19.40

Note: (a) Data not available

As shown in Table 4, annual mean NO₂ concentrations were below the AQO of 40µg/m³ at all monitoring sites in recent years, with the exception of LR13 in 2018.

Monitoring of PM₁₀ is undertaken at one location within the borough. Recent PM₁₀ results are shown in Table 5.

Table 5 PM₁₀ Monitoring Results

Monitoring Site	Monitored PM ₁₀ Concentration (µg/m ³)		
	2017	2018	2019
ES1 Southampton Road	20.9	22.5	21.1

As shown in Table 5, annual mean PM₁₀ concentrations were below the AQO of 40µg/m³ at the monitoring site in recent years.

Reference should be made to Figure 2 for a map of the survey positions.

It should be noted that pollutant concentrations during 2020 were lower than previous years due to a reduction in road traffic and associated emissions caused by the COVID-19 pandemic. The results were therefore not considered further within the assessment.

EBC do not undertake CO monitoring within the vicinity of the site.

Background Pollutant Monitoring

Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The proposed development is located in grid square NGR: 444500, 119500. Data for this location was downloaded from the DEFRA website⁷ for the purpose of the assessment and is summarised in Table 6.

Table 6 Background Pollutant Concentrations

Pollutant	Predicted Background Pollutant Concentration (µg/m ³)
NO ₂	17.73
PM ₁₀	15.95
CO	421

It should be noted that concentrations of NO₂ and PM₁₀ are predicted for 2022 and CO for 2001. These were the most recent predictions available at the time of assessment and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site.

Sensitive Receptors

A sensitive receptor is defined as any location which may be affected by changes in air quality. These have been defined for human and ecological receptors in the following Sections.

Human Receptors

A desk-top study was undertaken in order to identify any sensitive human receptor locations that required specific consideration during the assessment. This indicated that the site is surrounded by buildings of various heights. As such, discrete receptors were positioned at the top of each structure, closest to the flue and associated emissions.

⁷ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>.

In addition, in order ensure maximum impacts due to building downwash effects were considered, discrete points were positioned at ground floor level of each building, where relevant.

The sensitive human receptor locations are summarised in Table 7.

Table 7 Sensitive Human Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - Steele Close	444003.0	119702.1
R2	Residential - Oakmount Road	444065.5	119763.7
R3	Residential - Mount Drive	444147.3	119901.9
R4	Residential - Judd Close	444463.2	119600.7
R5	Residential - Leah Gardens	444536.3	119529.5
R6	Residential - Leigh Road	444388.8	119430.5
R7	Residential - Leigh Road	444482.6	119351.1
R8	Residential - Belmont Road	443806.1	119404.2
R9	Residential - Leigh Road	443873.8	119540.3

Reference should be made to Figure 3 for a map of the human receptor locations.

Ecological Receptors

Atmospheric emissions from the facility have the potential to impact on receptors of ecological sensitivity. A review of the Ecological Desk-Based Assessment⁸, produced by the Hampshire County Ecology Team, identified the following ecological designations within the vicinity of the facility:

- Boyatt Wood Site of Importance for Nature Conservation (SINC) and Ancient Woodland (AW);
- Woodland between railway & Monks Brook SINC;
- Monks Brook, Fleming Park SINC;
- Northend Copse (East & West of Flyover) SINC and AW; and,
- Parcels of Lowland Mixed Deciduous Woodlands.

For the purpose of the modelling assessment discrete receptors were placed at the closest point of each designation to the facility to ensure the maximum potential impact was predicted. These are summarised in Table 8.

⁸ Ecological Desk-Based Assessment, Hampshire Fire and Police Headquarters, Eastleigh, Hampshire County Ecology Team, August 2022.

Table 8 Sensitive Ecological Receptor Locations

Receptor		NGR (m)	
		X	Y
ER1	Boyatt Wood SINC and AW	444496.9	120176.4
ER2	Boyatt Wood SINC and AW	444598.1	120076.5
ER3	Northend Copse (East & West of Flyover) AW	443702.6	118962.9
ER4	Northend Copse (East & West of Flyover) AW	443665.3	119084.7
ER5	Woodland between railway & Monks Brook SINC	443822.0	120025.5
ER6	Monks Brook, Fleming Park SINC	444042.2	119337.4
ER7	Northend Copse (East & West of Flyover) SINC	443916.8	119297.5
ER8	Lowland Mixed Deciduous Woodland	444220.0	119711.0
ER9	Lowland Mixed Deciduous Woodland	444269.8	119683.8
ER10	Lowland Mixed Deciduous Woodland	444370.4	119645.3
ER11	Lowland Mixed Deciduous Woodland	444275.8	119445.6
ER12	Lowland Mixed Deciduous Woodland	444116.0	119392.0
ER13	Lowland Mixed Deciduous Woodland	443944.0	119569.6
ER14	Lowland Mixed Deciduous Woodland	444057.2	119749.5
ER15	Lowland Mixed Deciduous Woodland	444120.9	119784.4

Reference should be made to Figure 4 for a map of the ecological receptor locations.

Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of information provided by the APIS⁹ website and Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service¹⁰, as well as the relevant site designations and publicly available information, was undertaken in order to identify the most suitable habitat description and associated critical load for the area of each designation considered within the assessment.

The relevant nitrogen critical loads are presented in Table 9.

Table 9 Critical Loads for Nitrogen Deposition

Receptor	APIS Habitat	Relevant Nitrogen Critical Load Class	Nitrogen Critical Load (kgN/ha/yr)	
			Low	High
ER1 - ER15	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20

The site features were also reviewed to identify the habitat types most sensitive to acid deposition. These are summarised in Table 10.

⁹ <http://www.apis.ac.uk/>.

¹⁰ MAGIC, www.magic.gov.uk.

Table 10 Critical Loads for Acid Deposition

Receptor	APIS Habitat	Relevant Acid Critical Load Class	Acid Critical Load (keq/ha/yr)		
			CLMinN	CLMaxS	CLMaxN
ER1 & ER2	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.665	0.357	2.022
ER3 & ER4	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.706	0.357	2.063
ER5	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.666	0.357	2.023
ER7	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.708	0.357	2.065
ER6 & ER8 - ER12	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.83	0.142	1.972
ER13	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.708	0.357	2.065
ER14 & ER15	Broadleaved, Mixed and Yew Woodland	Broadleaved/Coniferous unmanaged woodland	1.83	0.142	1.972

Baseline pollutant concentrations and deposition rates at each ecological receptor were obtained from the APIS website and are summarised in Table 11. These are the maximum throughout each designation to ensure a worst-case assessment.

Table 11 Baseline Pollutant Levels at Ecological Receptors

Receptor	Annual Mean NO _x Concentration (µg/m ³)	Nitrogen (kgN/ha/yr)	Baseline Deposition Rate	
			Acid (keq/ha/yr)	
			Nitrogen	Sulphur
ER1	25.82	30.94	2.21	0.27
ER2	25.82	30.94	2.21	0.27
ER3	32.82	27.86	1.99	0.28
ER4	27.84	27.86	1.99	0.28
ER5	21.15	30.94	2.21	0.27
ER6	26.53	27.86	1.99	0.28
ER7	27.84	27.86	1.99	0.28
ER8	26.53	27.86	1.99	0.28
ER9	26.53	27.86	1.99	0.28
ER10	26.53	27.86	1.99	0.28
ER11	26.53	27.86	1.99	0.28
ER12	26.53	27.86	1.99	0.28
ER13	27.84	27.86	1.99	0.28
ER14	26.53	27.86	1.99	0.28
ER15	26.53	27.86	1.99	0.28

Methodology

Introduction

There is the potential for air quality impacts as a result of combustion emissions from the Fire Training Facility. In order to assess pollutant concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the following methodology.

Dispersion Model

Dispersion modelling was undertaken using ADMS-5.2 (v5.2.4.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-5 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages.

The model requires input data that details the following parameters:

- Assessment area;
- Process conditions;
- Pollutant emission rates;
- Terrain information;
- Building dimensions;
- Meteorological data;
- Roughness length (z_0); and,
- Monin-Obukhov length.

These are detailed in the following Sections.

Modelling Scenarios

The parameters considered in the modelling assessment for human receptors are summarised in Table 12.

Table 12 Human Receptor Assessment Parameters

Parameter	Modelled As	
	Short Term	Long Term
NO ₂	99.8 th percentile (%ile) 1-hour mean	Annual mean
PM ₁₀	90.4 th %ile 24-hour mean	Annual mean
CO	8-hour rolling mean	-

Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the %iles shown in Table 12 were selected to represent the relationship between the permitted number of exceedences of short-period concentrations and the number of periods within a calendar year.

The parameters considered in the modelling assessment for ecological receptors are summarised in Table 13.

Table 13 Ecological Receptor Assessment Parameters

Parameter	Modelled As	
	Short Term	Long Term
NO _x	24-hour mean	Annual mean
Nitrogen Deposition	-	Annual deposition
Acid Deposition	-	Annual deposition

Predicted pollutant concentrations were summarised in the following formats:

- Process contribution (PC) - Predicted pollutant level as a result of emissions from the facility only; and,
- Predicted environmental concentration (PEC) - Total predicted pollutant level as a result of emissions from the facility and existing baseline conditions.

Predicted pollutant concentrations were compared with the relevant AQOs, critical loads and critical levels. These criteria are collectively referred to as Environmental Quality Standards (EQSs).

Assessment Area

The assessment area was defined based on the facility location, anticipated pollutant dispersion patterns and the positioning of sensitive receptors. Ambient concentrations were predicted over NGR: 443500, 118850 to 445000, 120350. One Cartesian grid at with a resolution of 10m was used within the model to produce data suitable for contour plotting using the Surfer software package.

Reference should be made to Figure 5 for a graphical representation of the assessment grid extents.

Process Conditions

A summary of the source parameters used in the assessment is provided in Table 14. These were provided by the Applicant.

Table 14 Source Parameters

Parameter	Unit	Value
Stack position	NGR	444225.5, 119638.3
Stack height	m	12.0
Stack diameter	m	1.0
Exhaust gas temperature	°C	30.0
Exhaust gas flow rate	Nm ³ /s	17.29
Exhaust gas efflux velocity	m/s	22.01

Emissions

The Fire Training Facility will include a smoke scrubber to remove Particulate Matter (PM) prior to release to atmosphere. Maximum anticipated emissions were provided by the Technology Supplier. These are shown in Table 15.

Table 15 PM Pollutant Emission Concentration

Pollutant	Pollutant Emission Concentration (mg/Nm ³)
PM	60.00

Anticipated NO_x and CO emissions were not available from the Applicant. As such, emission rates were obtained from the United States Environmental Protection Agency (US EPA) 'AP-42: Compilation of Air Emissions Factors' (AP-42A). These are shown in Table 16.

Table 16 CO and NO_x Pollutant Emission Rates

Pollutant	Pollutant Emission Rate (g/kg)
NO _x	2.00
CO	70.00

The PM mass emission rate for use in the assessment was derived from the concentration shown in Table 15 and the flow rate shown in Table 14. The NO_x and CO emission rates shown in Table 16 were multiplied by the mass of OSB anticipated to be burnt per hour to calculate the mass emission for input into the model. The relevant values are summarised in Table 17.

Table 17 Pollutant Mass Emission Rate

Pollutant	Pollutant Mass Emission Rate (g/s)
NO _x	0.2000
PM	0.9344
CO	7.0000

The emission rate for PM is stated as total dust. However, for the purposes of dispersion modelling it was considered that the entire PM emission consisted of only PM₁₀. This allowed the maximum ground level impacts, with respect to the relevant EQS, to be assessed. Actual plant emissions of PM are unlikely to only consist of only one PM fraction, resulting in a worst-case assessment.

It should be noted that the combustion of OSB does not result in emissions of species which are likely to contribute to a significant increase in ambient pollutant levels other than those considered as part of the assessment.

Emissions from the facility were modelled constantly for the 3-hour operation period per day, 6-days per week.

NO_x to NO₂ Conversion

Emissions of total NO_x from combustion processes are predominantly in the form of nitric oxide (NO). Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO₂. Comparisons of ambient NO and NO₂ concentrations in the vicinity of point sources in recent years has indicated that it is unlikely that more than 30% of the NO_x is present at ground level as NO₂.

Ambient NO_x concentrations were predicted through dispersion modelling. Concentrations of NO₂ shown in the results section assume 70% conversion from NO_x to NO₂ for annual means and 35% conversion for 1-hour concentrations, based upon Environment Agency (EA) guidance¹¹.

Building Effects

The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures can interrupt the wind flows and cause significantly higher ground-level concentrations close to the source than would arise in the absence of the buildings.

Analysis of the site layout indicated that a number of structures should be included within the model in order to take account of effects on pollutant dispersion. Building input geometries are shown in Table 18.

Table 18 Building Geometries

Building	NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
	X	Y				
Fire Training Facility	444233.3	119628.1	10.4	12.0	9.6	198.9
Existing Smoke Training Facility	444255.9	119607.0	7.2	12.6	15.4	198.4

Meteorological Data

Meteorological data used in the assessment was obtained from Southampton Airport meteorological station over the period 1st January 2015 to 31st December 2019 (inclusive). Southampton Airport meteorological station is located at NGR: 444992, 116764, which is approximately 3.0km south-east of the development. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 6 for a wind rose of the utilised meteorological data.

Roughness Length

The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents and the meteorological site. This is considered appropriate for the morphology of both areas and is suggested within ADMS-5 as being suitable for 'parkland, open suburbia'.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents. This is considered appropriate for the nature of the area and is suggested within ADMS-5 as being suitable for 'cities and large towns'.

A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This is considered appropriate for the nature of the area and is suggested within ADMS-5 as being suitable for 'small towns <50,000'.

¹¹ <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports>.

Terrain Data

Ordnance Survey OS Terrain 50 data was included in the model for the site and surrounding area in order to take account of the specific flow field produced by variations in ground height throughout the assessment extents. This was pre-processed using the method suggested by CERC¹².

Nitrogen Deposition

Nitrogen deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'¹³. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used for the determination of nitrogen deposition are presented within Table 19.

Table 19 Conversion Factors to Determine Dry Deposition Flux for Nitrogen Deposition

Pollutant	Deposition Velocity (m/s)		Conversion Factor ($\mu\text{g}/\text{m}^2/\text{s}$ to $\text{kg}/\text{ha}/\text{yr}$ of pollutant species)
	Grassland	Forest	
NO ₂	0.0015	0.003	95.9

The relevant deposition velocity for each ecological receptor was selected from Table 19 based on the vegetation type present within the designation.

Acid Deposition

Predicted ground level NO₂ concentrations were converted to kilo-equivalent ion depositions ($\text{keq}/\text{ha}/\text{yr}$) for comparison with the critical load for acid deposition at each of the identified ecological receptors. The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken using the standard conversion factors shown in Table 20.

Table 20 Conversion Factors to Determine Dry Deposition Flux for Acid Deposition

Pollutant	Dep		Conversion Factor ($\mu\text{g}/\text{m}^2/\text{s}$ to $\text{keq}/\text{ha}/\text{yr}$ of pollutant species)
	Grassland	Forrest	
NO ₂	0.0015	0.003	6.84

The following formula was used to calculate predicted PCs as a proportion of the critical load function where PECs were identified to be greater than the CLminN value:

$$\text{PC as \%CL function} = (\text{PC of N deposition} / \text{CLmaxN}) \times 100$$

The above formula was obtained from the APIS website¹⁴.

¹² Note 105: Setting up Terrain Data for Input to CERC Models, CERC, 2016.

¹³ Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06, EA, 2014.

¹⁴ <http://www.apis.ac.uk>

Background Concentrations

Review of existing data was undertaken in order to identify suitable background values for use in the assessment. These were subsequently utilised to represent baseline pollutant levels at sensitive receptors in the vicinity of the site. A summary of relevant values is provided in Table 21.

Table 21 Background Pollutant Concentrations

Pollutant	Receptor	Background Pollutant Concentration Used in Model ($\mu\text{g}/\text{m}^3$)	Source	Justification
CO	R1 - R9	421	DEFRA Mapping	Only data available
PM ₁₀	R1 - R9	21.1	Local Monitoring Result	Monitor higher than DEFRA background
NO ₂	R1 - R3	24.4	Local Monitoring Result	
	R4 - R6	31.5		
	R7	31.6		
	R8 & R9	32.0		
NO _x , Nitrogen and Acid Deposition	Ecological Receptors	As shown in Table 11	APIS website	Only data available

It is not possible to add short-term peak baseline and process concentrations. This is because the conditions which give rise to peak ground-level concentrations of substances emitted from an elevated source at a particular location and time are likely to be different to the conditions which give rise to peak concentrations due to emissions from other sources. This point is addressed in in EA guidance 'Air emissions risk assessment for your environmental permit'¹⁵, which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. This approach was adopted throughout the assessment.

Assessment Criteria

Human Receptors

The significance of predicted air quality impacts at human receptors was determined in accordance with the guidance provided within the Institute of Air Quality Management (IAQM) document 'Land-Use Planning & Development Control: Planning for Air Quality'¹⁶. Using this methodology impacts on annual mean concentrations are defined based on the interaction between the predicted pollutant concentration with the development in place (PEC) and the magnitude of change (PC), as outlined in Table 22.

Table 22 Significance of Impact - Annual Mean Concentrations

Concentrations at Receptor in Assessment Year (PEC)	Predicted Concentration Change of Proportion of AQO (PC) (%)			
	1	2 - 5	6 - 10	>10
75% or Less of EQS	Negligible	Negligible	Slight	Moderate

¹⁵ Air emissions risk assessment for your environmental permit, EA, 2016.

¹⁶ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

76 - 94% of EQS	Negligible	Slight	Moderate	Moderate
95 - 102% of EQS	Slight	Moderate	Moderate	Substantial
103 - 109% of EQS	Moderate	Moderate	Substantial	Substantial
110% or more of EQS	Moderate	Substantial	Substantial	Substantial

The matrix shown in Table 22 is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e. less than 0.5%, are described as **negligible**.

The significance of impacts on short-term pollutant concentrations at sensitive receptors was determined in accordance with the criteria outlined in the IAQM document 'Land-Use Planning & Development Control: Planning for Air Quality'¹⁷, as summarised in Table 23.

Table 23 Significance of Impact - Short Term Concentrations

Predicted Concentration Change as a Proportion of EQS (PC) (%)	Significance of Impact
Less than 10	Negligible
11 - 20	Slight
21 - 50	Moderate
Greater than 51	Substantial

Following the prediction of impacts at discrete receptor locations, the IAQM provides guidance on determining the overall air quality impact significance of the operation of a development and states that an assessment must reach a conclusion on the likely significance of the predicted impact. Where the overall effect is **moderate** or **substantial**, the effect is likely to be considered **significant**, whilst if the impact is **slight** or **negligible**, the impact is likely to be considered **not significant**. It should be noted that this is a binary judgement of either it is **significant** or it is **not significant**. The determination of significance relies on professional judgement and reasoning has been provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

Ecological Receptors

EA guidance 'Air emissions risk assessment for your environmental permit'¹⁸ states that PCs at local sites, such as SINC, AWs and priority habitats, can be screened as insignificant if they meet the following criteria:

- The short-term PC is less than 100% of the short-term environmental standard for protected conservation areas; and,
- The long-term PC is less than 100% of the long-term environmental standard for protected conservation areas.

Predicted PCs have been compared to the relevant EQSs and the criteria stated above. Where the impact is within these parameters, the EA concludes that impacts associated with an installation are acceptable.

¹⁷ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

¹⁸ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>.

Modelling Uncertainty

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and,
- Variability - randomness of measurements used.

Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-5 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using five annual meteorological data sets from an observation station local to the site to account for inter-year variability. The assessment was based on the worst-case year to ensure maximum concentrations were considered;
- Surface characteristics - The z_0 and Monin-Obukhov length were determined for both the dispersion and meteorological sites based on the surrounding land uses and guidance provided by CERC. Terrain data was included and processed using the method outlined by CERC;
- Operating conditions - Operational parameters were provided by the Applicant and Technology Provider. As such, input parameters are considered to be representative of anticipated operating conditions;
- Emission rates - Emission rates were derived from the relevant abatement plant specification and international research on pollutant releases. As such, these are considered to be representative of anticipated emissions;
- Background concentrations - Background pollutant levels were obtained from local monitoring results, DEFRA mapping study and APIS website. These are considered representative of baseline air quality conditions at sensitive locations within the vicinity of the site;
- Receptor locations - A Cartesian Grid was included in the model in order to provide suitable data for contour plotting. Receptor points were also included at sensitive locations to provide additional consideration of these areas; and,
- Variability - All model inputs were as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential pollutant concentrations.

Results were considered in the context of the relevant EQSs. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

Results

Introduction

Dispersion modelling was undertaken with the inputs described previously. The results are outlined in the following Sections.

Reference should be made to Figures 7 to 11 for graphical representations of predicted pollutant concentrations, inclusive of background pollutant levels, throughout the assessment extents. It should be noted that the values shown in the Figures are predictions from the meteorological data set which resulted in the maximum pollutant concentration for that species and elevation. For example, the maximum annual mean NO₂ concentration was predicted using the 2015 meteorological data set. As such, the contours shown in Figure 7 were produced from these outputs.

Human Receptors

Nitrogen Dioxide

Annual mean NO₂ PECs at the sensitive receptors are summarised in Table 24.

Table 24 Predicted Annual Mean NO₂ Concentrations

Receptors		Predicted Annual Mean NO ₂ PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R1	Residential - Steele Close	24.42	24.42	24.42	24.43	24.46
R2	Residential - Oakmount Road	24.44	24.44	24.46	24.45	24.48
R3	Residential - Mount Drive	24.43	24.43	24.43	24.44	24.44
R4	Residential - Judd Close	31.58	31.57	31.60	31.57	31.55
R5	Residential - Leah Gardens	31.55	31.54	31.55	31.54	31.53
R6	Residential - Leigh Road	31.55	31.54	31.55	31.53	31.54
R7	Residential - Leigh Road	31.63	31.62	31.63	31.62	31.62
R8	Residential - Belmont Road	39.01	39.01	39.01	39.01	39.01
R9	Residential - Leigh Road	39.01	39.02	39.01	39.02	39.02

As indicated in Table 24, NO₂ PECs were below the annual mean EQS of 40µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 7 for a graphical representation of predicted annual mean NO₂ PC concentrations throughout the assessment extents.

The significance of predicted impacts on annual mean NO₂ concentrations at the sensitive receptors are summarised in Table 25. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 25 Predicted Impacts on Annual Mean NO₂ Concentrations

Receptors		Predicted Concentration (PEC)	Predicted Concentration as Proportion of EQS (PC) (%)	Impact Significance
R1	Residential - Steele Close	Below 75% of EQS	0	Negligible
R2	Residential - Oakmount Road	Below 75% of EQS	0	Negligible
R3	Residential - Mount Drive	Below 75% of EQS	0	Negligible
R4	Residential - Judd Close	76 - 94% of EQS	0	Negligible
R5	Residential - Leah Gardens	76 - 94% of EQS	0	Negligible
R6	Residential - Leigh Road	76 - 94% of EQS	0	Negligible
R7	Residential - Leigh Road	76 - 94% of EQS	0	Negligible
R8	Residential - Belmont Road	95 - 102% of EQS	0	Negligible
R9	Residential - Leigh Road	95 - 102% of EQS	0	Negligible

As indicated in Table 25, impacts on annual mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all sensitive receptors. This is classified as **not significant**, in accordance with the stated guidance.

Predicted 99.8th %ile 1-hour mean NO₂ PECs at the sensitive receptors are summarised in Table 26.

Table 26 Predicted 99.8th %ile 1-hour mean NO₂ Concentrations

Receptors		Predicted 99.8 th %ile 1-hour mean NO ₂ PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R1	Residential - Steele Close	50.40	50.09	50.21	50.39	50.59
R2	Residential - Oakmount Road	50.87	50.98	51.15	50.99	51.12
R3	Residential - Mount Drive	50.34	50.20	50.07	50.13	50.28
R4	Residential - Judd Close	64.66	64.68	64.81	64.72	64.62
R5	Residential - Leah Gardens	64.17	64.10	64.15	64.15	63.97
R6	Residential - Leigh Road	64.49	64.45	64.53	64.48	64.49
R7	Residential - Leigh Road	64.05	64.04	64.03	64.08	64.06
R8	Residential - Belmont Road	78.54	78.60	78.44	78.56	78.52
R9	Residential - Leigh Road	78.81	78.86	78.73	78.86	78.93

As indicated in Table 26, 99.8th %ile 1-hour NO₂ PECs were below the EQS of 200µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 8 for a graphical representation of predicted 99.8th %ile 1-hour mean NO₂ PC concentrations throughout the assessment extents.

The significance of predicted impacts on 1-hour mean NO₂ concentrations at the sensitive receptors are summarised in Table 27. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 27 Predicted Impacts on 1-hour Mean NO₂ Concentrations

Receptors		Predicted Concentration as Proportion of EQS (PC) (%)	Impact Significance
R1	Residential - Steele Close	Less than 10	Negligible
R2	Residential - Oakmount Road	Less than 10	Negligible
R3	Residential - Mount Drive	Less than 10	Negligible
R4	Residential - Judd Close	Less than 10	Negligible
R5	Residential - Leah Gardens	Less than 10	Negligible
R6	Residential - Leigh Road	Less than 10	Negligible
R7	Residential - Leigh Road	Less than 10	Negligible
R8	Residential - Belmont Road	Less than 10	Negligible
R9	Residential - Leigh Road	Less than 10	Negligible

As indicated in Table 27, impacts on 1-hour mean NO₂ concentrations as a result of the proposed development were predicted to be **negligible** at all sensitive receptors. This is classified as **not significant**, in accordance with the stated guidance.

Particulate Matter

Annual mean PM₁₀ PECs at the sensitive receptors are summarised in Table 28.

Table 28 Predicted Annual Mean PM₁₀ Concentrations

Receptors		Predicted Annual Mean PM ₁₀ PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R1	Residential - Steele Close	21.26	21.24	21.24	21.29	21.49
R2	Residential - Oakmount Road	21.40	21.38	21.47	21.45	21.65
R3	Residential - Mount Drive	21.32	21.31	21.33	21.36	21.39
R4	Residential - Judd Close	21.65	21.55	21.74	21.59	21.43
R5	Residential - Leah Gardens	21.43	21.39	21.45	21.38	21.28
R6	Residential - Leigh Road	21.40	21.37	21.42	21.31	21.37
R7	Residential - Leigh Road	21.27	21.25	21.28	21.22	21.25
R8	Residential - Belmont Road	21.17	21.19	21.14	21.20	21.17
R9	Residential - Leigh Road	21.20	21.21	21.15	21.22	21.22

As indicated in Table 28, PM₁₀ PECs were below the annual mean EQS of 40µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 9 for a graphical representation of predicted annual mean PM₁₀ PC concentrations throughout the assessment extents.

The significance of predicted impacts on annual mean PM₁₀ concentrations at the sensitive receptors are summarised in Table 29. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 29 Predicted Impacts on Annual Mean PM₁₀ Concentrations

Receptors		Predicted Concentration (PEC)	Predicted Concentration as Proportion of EQS (PC) (%)	Impact Significance
R1	Residential - Steele Close	Below 75% of EQS	1	Negligible
R2	Residential - Oakmount Road	Below 75% of EQS	1	Negligible
R3	Residential - Mount Drive	Below 75% of EQS	1	Negligible
R4	Residential - Judd Close	Below 75% of EQS	2 - 5	Negligible
R5	Residential - Leah Gardens	Below 75% of EQS	1	Negligible
R6	Residential - Leigh Road	Below 75% of EQS	1	Negligible
R7	Residential - Leigh Road	Below 75% of EQS	0	Negligible
R8	Residential - Belmont Road	Below 75% of EQS	0	Negligible
R9	Residential - Leigh Road	Below 75% of EQS	0	Negligible

As indicated in Table 29, impacts on annual mean PM₁₀ concentrations as a result of the proposed development were predicted to be **negligible** at all sensitive receptors. This is classified as **not significant**, in accordance with the stated guidance.

Predicted 90.4th %ile 24-hour mean PM₁₀ PECs at the sensitive receptors are summarised in Table 30.

Table 30 Predicted 90.4th %ile 24-hour mean PM₁₀ Concentrations

Receptors		Predicted 90.4 th %ile 24-hour mean PM ₁₀ PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R1	Residential - Steele Close	42.57	42.61	42.53	42.92	44.38
R2	Residential - Oakmount Road	43.28	43.06	43.93	43.76	45.56
R3	Residential - Mount Drive	43.19	43.02	43.32	43.34	43.68
R4	Residential - Judd Close	44.66	43.98	44.86	44.51	43.68
R5	Residential - Leah Gardens	43.71	43.43	43.78	43.52	43.04
R6	Residential - Leigh Road	43.43	43.31	43.75	43.01	43.55
R7	Residential - Leigh Road	42.95	42.81	43.10	42.63	42.88
R8	Residential - Belmont Road	42.33	42.50	42.21	42.63	42.43
R9	Residential - Leigh Road	42.42	42.49	42.20	42.66	42.58

As indicated in Table 30, 90.4th %ile 24-hour PM₁₀ PECs were below the EQS of 50µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 10 for a graphical representation of predicted 24-hour mean PM₁₀ PC concentrations throughout the assessment extents.

The significance of predicted impacts on 24-hour mean PM₁₀ concentrations at the sensitive receptors are summarised in Table 31. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 31 Predicted Impacts on 24-hour Mean PM₁₀ Concentrations

Receptors		Predicted Concentration as Proportion of EQS (PC) (%)	Impact Significance
R1	Residential - Steele Close	Less than 10	Negligible
R2	Residential - Oakmount Road	Less than 10	Negligible
R3	Residential - Mount Drive	Less than 10	Negligible
R4	Residential - Judd Close	Less than 10	Negligible
R5	Residential - Leah Gardens	Less than 10	Negligible
R6	Residential - Leigh Road	Less than 10	Negligible
R7	Residential - Leigh Road	Less than 10	Negligible
R8	Residential - Belmont Road	Less than 10	Negligible
R9	Residential - Leigh Road	Less than 10	Negligible

As indicated in Table 31, impacts on 24-hour mean PM₁₀ concentrations as a result of the proposed development were predicted to be **negligible** at all sensitive receptors. This is classified as **not significant**, in accordance with the stated guidance.

Carbon Monoxide

Predicted 100th %ile 8-hour rolling mean CO PECs at the sensitive receptors are summarised in Table 32.

Table 32 Predicted 100th %ile 8-hour rolling mean CO Concentrations

Receptors		Predicted 100 th %ile 8-hour rolling mean CO PEC (µg/m ³)				
		2015	2016	2017	2018	2019
R1	Residential - Steele Close	988.1	937.9	988.6	935.1	975.2
R2	Residential - Oakmount Road	1,048.1	1,076.1	1,086.1	1,020.0	1,039.7
R3	Residential - Mount Drive	942.4	931.3	917.5	980.9	949.5
R4	Residential - Judd Close	941.9	938.5	1,038.4	994.1	991.2
R5	Residential - Leah Gardens	930.1	913.6	957.9	956.9	924.4
R6	Residential - Leigh Road	943.4	957.3	942.0	978.4	976.6
R7	Residential - Leigh Road	896.2	917.2	922.6	925.2	932.4
R8	Residential - Belmont Road	873.8	892.4	899.1	877.8	930.1
R9	Residential - Leigh Road	885.9	921.3	896.3	905.0	916.1

As indicated in Table 32, 100th %ile 8-hour rolling CO PECs were below the EQS of 10,000µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 11 for a graphical representation of predicted 8-hour rolling mean CO PC concentrations throughout the assessment extents.

The significance of predicted impacts on 8-hour rolling mean CO concentrations at the sensitive receptors are summarised in Table 33. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 33 Predicted Impacts on 8-hour Rolling Mean CO Concentrations

Receptors		Predicted Concentration as Proportion of EQS (PC) (%)	Impact Significance
R1	Residential - Steele Close	Less than 10	Negligible
R2	Residential - Oakmount Road	Less than 10	Negligible
R3	Residential - Mount Drive	Less than 10	Negligible
R4	Residential - Judd Close	Less than 10	Negligible
R5	Residential - Leah Gardens	Less than 10	Negligible
R6	Residential - Leigh Road	Less than 10	Negligible
R7	Residential - Leigh Road	Less than 10	Negligible
R8	Residential - Belmont Road	Less than 10	Negligible
R9	Residential - Leigh Road	Less than 10	Negligible

As indicated in Table 33, impacts on 8-hour rolling mean CO concentrations as a result of the proposed development were predicted to be **negligible** at all sensitive receptors. This is classified as **not significant**, in accordance with the stated guidance.

Ecological Receptors

Predicted pollutant concentrations at the sensitive ecological receptor locations identified in Table 8 are summarised in the following Sections.

Nitrogen Oxides

Predicted annual mean NO_x PECs at the sensitive receptors are summarised in Table 34. Exceedences of the relevant EQS are shown in **bold**.

Table 34 Predicted Annual Mean NO_x Concentrations

Receptors		Predicted Annual Mean NO _x PEC (µg/m ³)				
		2015	2016	2017	2018	2019
ER1	Boyatt Wood SINC and AW	25.86	25.86	25.86	25.86	25.86
ER2	Boyatt Wood SINC and AW	25.86	25.86	25.86	25.86	25.86
ER3	Northend Copse (East & West of Flyover) AW	32.83	32.83	32.83	32.83	32.83
ER4	Northend Copse (East & West of Flyover) AW	27.85	27.85	27.85	27.85	27.85
ER5	Woodland between railway & Monks Brook SINC	21.16	21.16	21.17	21.17	21.17
ER6	Monks Brook, Fleming Park SINC	26.57	26.57	26.56	26.59	26.56

ER7	Northend Copse (East & West of Flyover) SINC	27.86	27.87	27.85	27.87	27.86
ER8	Lowland Mixed Deciduous Woodland	26.66	26.67	26.68	26.72	26.74
ER9	Lowland Mixed Deciduous Woodland	26.70	26.67	26.67	26.66	26.66
ER10	Lowland Mixed Deciduous Woodland	26.71	26.68	26.76	26.70	26.66
ER11	Lowland Mixed Deciduous Woodland	26.59	26.61	26.61	26.59	26.62
ER12	Lowland Mixed Deciduous Woodland	26.59	26.59	26.57	26.61	26.57
ER13	Lowland Mixed Deciduous Woodland	27.87	27.87	27.86	27.88	27.88
ER14	Lowland Mixed Deciduous Woodland	26.59	26.58	26.60	26.60	26.65
ER15	Lowland Mixed Deciduous Woodland	26.62	26.61	26.63	26.64	26.65

As indicated in Table 34, predicted annual mean NO_x concentrations were below the EQS of 30µg/m³ at all ecological receptor locations for all meteorological data sets, with the exception of ER3. However, the predicted exceedences are as a result of high baseline levels.

Maximum predicted annual mean NO_x concentrations at the receptors are summarised in in Table 35.

Table 35 Predicted Impacts on Annual Mean NO_x Concentrations

Receptors		Maximum Predicted Annual Mean NO _x Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Boyatt Wood SINC and AW	0.04	25.86	0.13	86.20
ER2	Boyatt Wood SINC and AW	0.04	25.86	0.15	86.22
ER3	Northend Copse (East & West of Flyover) AW	0.01	32.83	0.04	109.44
ER4	Northend Copse (East & West of Flyover) AW	0.01	27.85	0.04	92.84
ER5	Woodland between railway & Monks Brook SINC	0.02	21.17	0.08	70.58
ER6	Monks Brook, Fleming Park SINC	0.06	26.59	0.19	88.63
ER7	Northend Copse (East & West of Flyover) SINC	0.03	27.87	0.11	92.91
ER8	Lowland Mixed Deciduous Woodland	0.21	26.74	0.70	89.13
ER9	Lowland Mixed Deciduous Woodland	0.17	26.70	0.55	88.99
ER10	Lowland Mixed Deciduous Woodland	0.23	26.76	0.76	89.19
ER11	Lowland Mixed Deciduous Woodland	0.09	26.62	0.29	88.73
ER12	Lowland Mixed Deciduous Woodland	0.08	26.61	0.28	88.71
ER13	Lowland Mixed Deciduous Woodland	0.04	27.88	0.12	92.92
ER14	Lowland Mixed Deciduous Woodland	0.12	26.65	0.40	88.84
ER15	Lowland Mixed Deciduous Woodland	0.12	26.65	0.39	88.82

As shown in Table 35, PCs were below 100% of the EQS at all ecological receptor locations. As such, predicted impacts on annual mean NO_x concentrations are considered to be **not significant**, in accordance with the stated criteria.

Predicted 24-hour mean NO_x PECs at the sensitive receptors are summarised in Table 36.

Table 36 Predicted 24-hour Mean NO_x Concentrations

Receptors		Predicted 24-hour Mean NO _x PEC (µg/m ³)				
		2015	2016	2017	2018	2019
ER1	Boyatt Wood SINC and AW	52.02	52.23	52.16	52.17	52.49
ER2	Boyatt Wood SINC and AW	52.00	52.19	52.30	52.06	52.19
ER3	Northend Copse (East & West of Flyover) AW	65.79	65.81	66.21	65.89	66.08
ER4	Northend Copse (East & West of Flyover) AW	55.89	55.87	56.29	55.83	56.15
ER5	Woodland between railway & Monks Brook SINC	42.81	43.60	43.06	42.75	42.94
ER6	Monks Brook, Fleming Park SINC	53.72	53.65	53.71	53.93	53.87
ER7	Northend Copse (East & West of Flyover) SINC	56.19	56.17	56.35	56.15	56.30
ER8	Lowland Mixed Deciduous Woodland	55.59	56.85	56.21	58.40	56.39
ER9	Lowland Mixed Deciduous Woodland	54.68	54.39	54.71	54.36	54.86
ER10	Lowland Mixed Deciduous Woodland	56.36	54.33	55.74	55.29	55.23
ER11	Lowland Mixed Deciduous Woodland	54.56	54.97	54.39	54.62	55.62
ER12	Lowland Mixed Deciduous Woodland	54.12	53.96	54.28	54.30	54.34
ER13	Lowland Mixed Deciduous Woodland	56.67	56.35	56.60	56.54	56.60
ER14	Lowland Mixed Deciduous Woodland	54.79	55.56	55.82	54.40	56.21
ER15	Lowland Mixed Deciduous Woodland	55.13	57.06	56.74	54.99	55.35

As indicated in Table 36, predicted 24-hour mean NO_x concentrations were below the EQS of 75µg/m³ at all ecological receptor locations for all meteorological data sets.

Maximum predicted 24-hour mean NO_x concentrations at the receptors are summarised in in Table 37.

Table 37 Predicted Impacts on 24-hour Mean NO_x Concentrations

Receptors		Maximum Predicted 24-hour Mean NO _x Concentration (µg/m ³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Boyatt Wood SINC and AW	0.85	52.49	1.13	69.98
ER2	Boyatt Wood SINC and AW	0.66	52.30	0.87	69.73
ER3	Northend Copse (East & West of Flyover) AW	0.57	66.21	0.76	88.28
ER4	Northend Copse (East & West of Flyover) AW	0.61	56.29	0.81	75.05
ER5	Woodland between railway & Monks Brook SINC	1.30	43.60	1.74	58.14
ER6	Monks Brook, Fleming Park SINC	0.87	53.93	1.16	71.91
ER7	Northend Copse (East & West of Flyover) SINC	0.67	56.35	0.89	75.13
ER8	Lowland Mixed Deciduous Woodland	5.34	58.40	7.12	77.87
ER9	Lowland Mixed Deciduous Woodland	1.80	54.86	2.40	73.15
ER10	Lowland Mixed Deciduous Woodland	3.30	56.36	4.39	75.14
ER11	Lowland Mixed Deciduous Woodland	2.56	55.62	3.41	74.16

ER12	Lowland Mixed Deciduous Woodland	1.28	54.34	1.71	72.46
ER13	Lowland Mixed Deciduous Woodland	0.99	56.67	1.32	75.56
ER14	Lowland Mixed Deciduous Woodland	3.15	56.21	4.20	74.95
ER15	Lowland Mixed Deciduous Woodland	4.00	57.06	5.34	76.08

As shown in Table 37, PCs were below 100% of the EQS at all ecological receptor locations. As such, predicted effects on 24-hour mean NO_x concentrations are considered to be **not significant**, in accordance with the stated criteria.

Nitrogen Deposition

Predicted annual nitrogen PC deposition rates at the receptors are summarised in Table 38.

Table 38 Predicted Annual Nitrogen Deposition Rates

Receptors		Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)				
		2015	2016	2017	2018	2019
ER1	Boyatt Wood SINC and AW	0.007	0.007	0.008	0.008	0.008
ER2	Boyatt Wood SINC and AW	0.009	0.008	0.008	0.008	0.008
ER3	Northend Copse (East & West of Flyover) AW	0.001	0.002	0.001	0.002	0.001
ER4	Northend Copse (East & West of Flyover) AW	0.001	0.002	0.001	0.002	0.001
ER5	Woodland between railway & Monks Brook SINC	0.003	0.003	0.004	0.004	0.005
ER6	Monks Brook, Fleming Park SINC	0.008	0.009	0.005	0.012	0.006
ER7	Northend Copse (East & West of Flyover) SINC	0.004	0.005	0.003	0.007	0.004
ER8	Lowland Mixed Deciduous Woodland	0.027	0.029	0.030	0.038	0.042
ER9	Lowland Mixed Deciduous Woodland	0.033	0.028	0.029	0.026	0.025
ER10	Lowland Mixed Deciduous Woodland	0.037	0.030	0.046	0.034	0.026
ER11	Lowland Mixed Deciduous Woodland	0.012	0.016	0.016	0.013	0.018
ER12	Lowland Mixed Deciduous Woodland	0.012	0.013	0.008	0.017	0.009
ER13	Lowland Mixed Deciduous Woodland	0.006	0.007	0.003	0.007	0.007
ER14	Lowland Mixed Deciduous Woodland	0.012	0.011	0.015	0.014	0.024
ER15	Lowland Mixed Deciduous Woodland	0.018	0.017	0.020	0.021	0.024

Maximum predicted annual nitrogen deposition rates at the receptor locations are summarised in Table 39.

Table 39 Maximum Predicted Annual Nitrogen Deposition Rates

Receptors		Maximum Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)	Proportion of EQS (%)	
			Low EQS	High EQS
ER1	Boyatt Wood SINC and AW	0.008	0.08	0.04
ER2	Boyatt Wood SINC and AW	0.009	0.09	0.04
ER3	Northend Copse (East & West of Flyover) AW	0.002	0.02	0.01
ER4	Northend Copse (East & West of Flyover) AW	0.002	0.02	0.01

ER5	Woodland between railway & Monks Brook SINC	0.005	0.05	0.02
ER6	Monks Brook, Fleming Park SINC	0.012	0.12	0.06
ER7	Northend Copse (East & West of Flyover) SINC	0.007	0.07	0.03
ER8	Lowland Mixed Deciduous Woodland	0.042	0.42	0.21
ER9	Lowland Mixed Deciduous Woodland	0.033	0.33	0.17
ER10	Lowland Mixed Deciduous Woodland	0.046	0.46	0.23
ER11	Lowland Mixed Deciduous Woodland	0.018	0.18	0.09
ER12	Lowland Mixed Deciduous Woodland	0.017	0.17	0.08
ER13	Lowland Mixed Deciduous Woodland	0.007	0.07	0.04
ER14	Lowland Mixed Deciduous Woodland	0.024	0.24	0.12
ER15	Lowland Mixed Deciduous Woodland	0.024	0.24	0.12

As shown in Table 39, PCs were below 100% of the EQS at all ecological receptor locations. As such, predicted impacts on nitrogen deposition rates are considered to be **not significant**, in accordance with the stated criteria.

Acid Deposition

Predicted annual acid PC deposition rates at the receptors are summarised in Table 40.

Table 40 Predicted Annual Acid Deposition Rates

Receptors		Predicted Annual Acid Deposition Rate (keq/ha/yr)				
		2015	2016	2017	2018	2019
ER1	Boyatt Wood SINC and AW	0.0005	0.0005	0.0005	0.0005	0.0006
ER2	Boyatt Wood SINC and AW	0.0006	0.0006	0.0006	0.0005	0.0005
ER3	Northend Copse (East & West of Flyover) AW	0.0001	0.0001	0.0001	0.0002	0.0001
ER4	Northend Copse (East & West of Flyover) AW	0.0001	0.0001	0.0001	0.0002	0.0001
ER5	Woodland between railway & Monks Brook SINC	0.0002	0.0002	0.0003	0.0003	0.0003
ER6	Monks Brook, Fleming Park SINC	0.0005	0.0006	0.0004	0.0008	0.0004
ER7	Northend Copse (East & West of Flyover) SINC	0.0003	0.0004	0.0002	0.0005	0.0003
ER8	Lowland Mixed Deciduous Woodland	0.0019	0.0020	0.0022	0.0027	0.0030
ER9	Lowland Mixed Deciduous Woodland	0.0024	0.0020	0.0021	0.0018	0.0018
ER10	Lowland Mixed Deciduous Woodland	0.0026	0.0021	0.0033	0.0024	0.0018
ER11	Lowland Mixed Deciduous Woodland	0.0008	0.0012	0.0011	0.0009	0.0013
ER12	Lowland Mixed Deciduous Woodland	0.0009	0.0009	0.0006	0.0012	0.0006
ER13	Lowland Mixed Deciduous Woodland	0.0004	0.0005	0.0002	0.0005	0.0005
ER14	Lowland Mixed Deciduous Woodland	0.0008	0.0008	0.0010	0.0010	0.0017
ER15	Lowland Mixed Deciduous Woodland	0.0013	0.0012	0.0014	0.0015	0.0017

Maximum predicted annual acid deposition rates at the receptor locations are summarised in Table 41Table 39.

Table 41 Maximum Predicted Annual Acid Deposition Rates

Receptors	Maximum Predicted Annual Acid Deposition Rate (keq/ha/yr)	Proportion of EQS (%)
ER1 Boyatt Wood SINC and AW	0.0006	0.03
ER2 Boyatt Wood SINC and AW	0.0006	0.03
ER3 Northend Copse (East & West of Flyover) AW	0.0002	0.01
ER4 Northend Copse (East & West of Flyover) AW	0.0002	0.01
ER5 Woodland between railway & Monks Brook SINC	0.0003	0.02
ER6 Monks Brook, Fleming Park SINC	0.0008	0.04
ER7 Northend Copse (East & West of Flyover) SINC	0.0005	0.02
ER8 Lowland Mixed Deciduous Woodland	0.0030	0.15
ER9 Lowland Mixed Deciduous Woodland	0.0024	0.12
ER10 Lowland Mixed Deciduous Woodland	0.0033	0.17
ER11 Lowland Mixed Deciduous Woodland	0.0013	0.06
ER12 Lowland Mixed Deciduous Woodland	0.0012	0.06
ER13 Lowland Mixed Deciduous Woodland	0.0005	0.02
ER14 Lowland Mixed Deciduous Woodland	0.0017	0.09
ER15 Lowland Mixed Deciduous Woodland	0.0017	0.09

As shown in Table 41Table 39, PCs were below 100% of the EQS at all ecological receptor locations. As such, predicted impacts on acid deposition rates are considered to be **not significant**, in accordance with the stated criteria.

Conclusion

Build Energy was commissioned by Morgan Sindall Construction & Infrastructure Ltd to undertake an Air Quality Assessment in support of a planning application for a new Fire Training Facility on land off Leigh Road, Eastleigh

A pre-application response from EBC raised concerns that atmospheric emissions associated with the operation of the Fire Training Facility may cause air quality impacts at sensitive locations in the vicinity of the site. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and quantify potential effects.

Dispersion modelling was undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the development. The results indicated NO₂, PM₁₀ and CO concentrations were predicted to be below the relevant EQSs at all sensitive human receptors for all meteorological data sets assessed.

Review of the dispersion modelling results also indicated that impacts on NO₂, PM₁₀ and CO concentrations were predicted to be **negligible** at all human receptor locations. As such, overall impacts are considered to be **not significant** in accordance with the IAQM methodology.

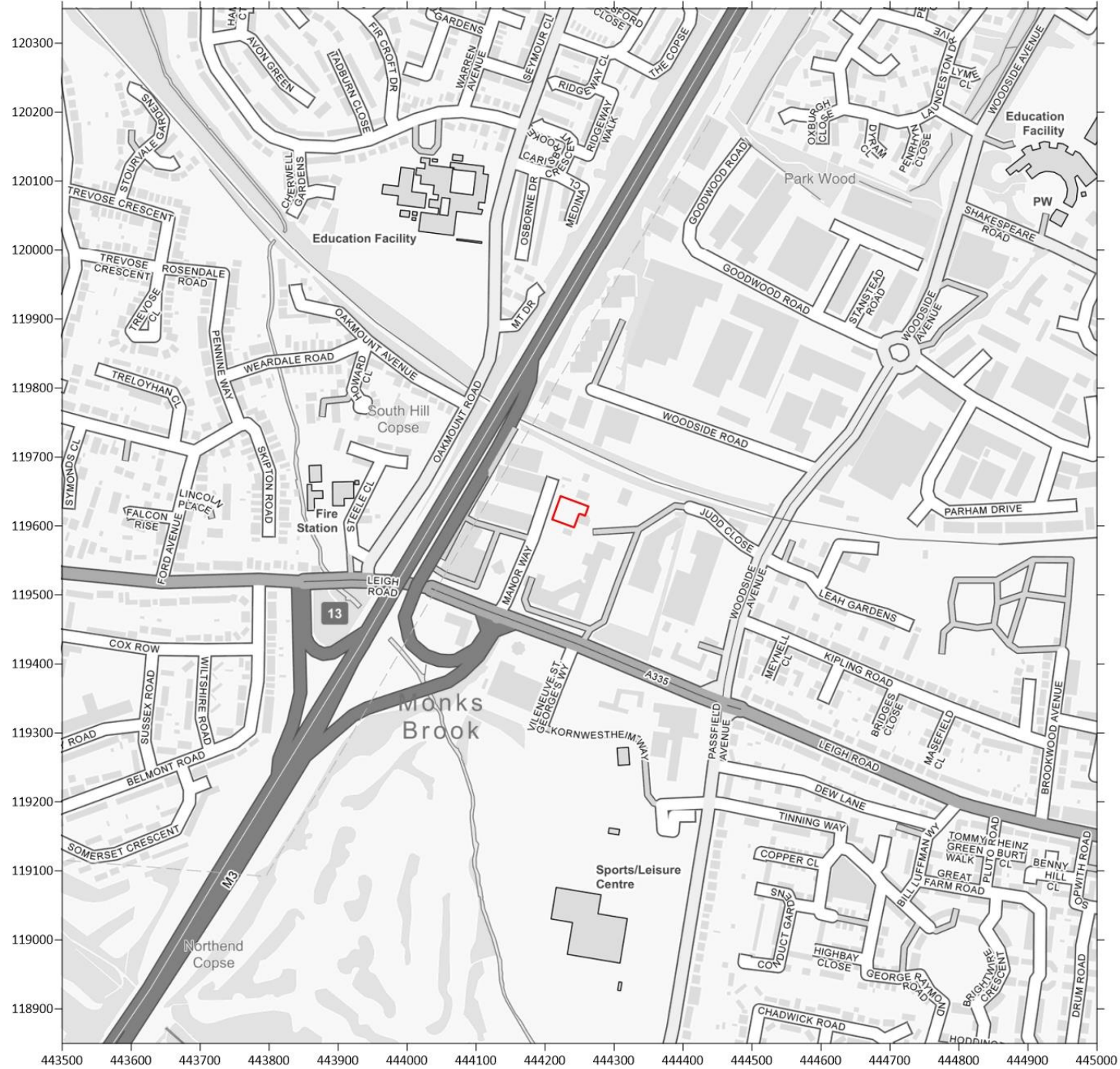
Impacts at all relevant ecological sites were predicted to be **not significant**, in accordance with the EA criteria.

Based on the assessment results, air quality factors are not considered a constraint to planning consent for the proposals.

Abbreviations

ADM	Atmospheric Dispersion Modelling
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AW	Ancient Woodland
CERC	Cambridge Environmental Research Consultants
CO	Carbon Monoxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EBC	Eastleigh Borough Council
EQS	Environmental Quality Standard
IAQM	Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
PC	Process contribution
PEC	Predicted environmental concentration
PM	Particulate Matter
PM ₁₀	Particulate matter with an aerodynamic diameter of less than 10µm
SINC	Site of Importance for Nature Conservation
z ₀	Roughness length

Figures



Legend



Site Boundary

Title

Figure 1 - Site Location Plan

Project

Air Quality Assessment
Leigh Road, Eastleigh

Project Reference

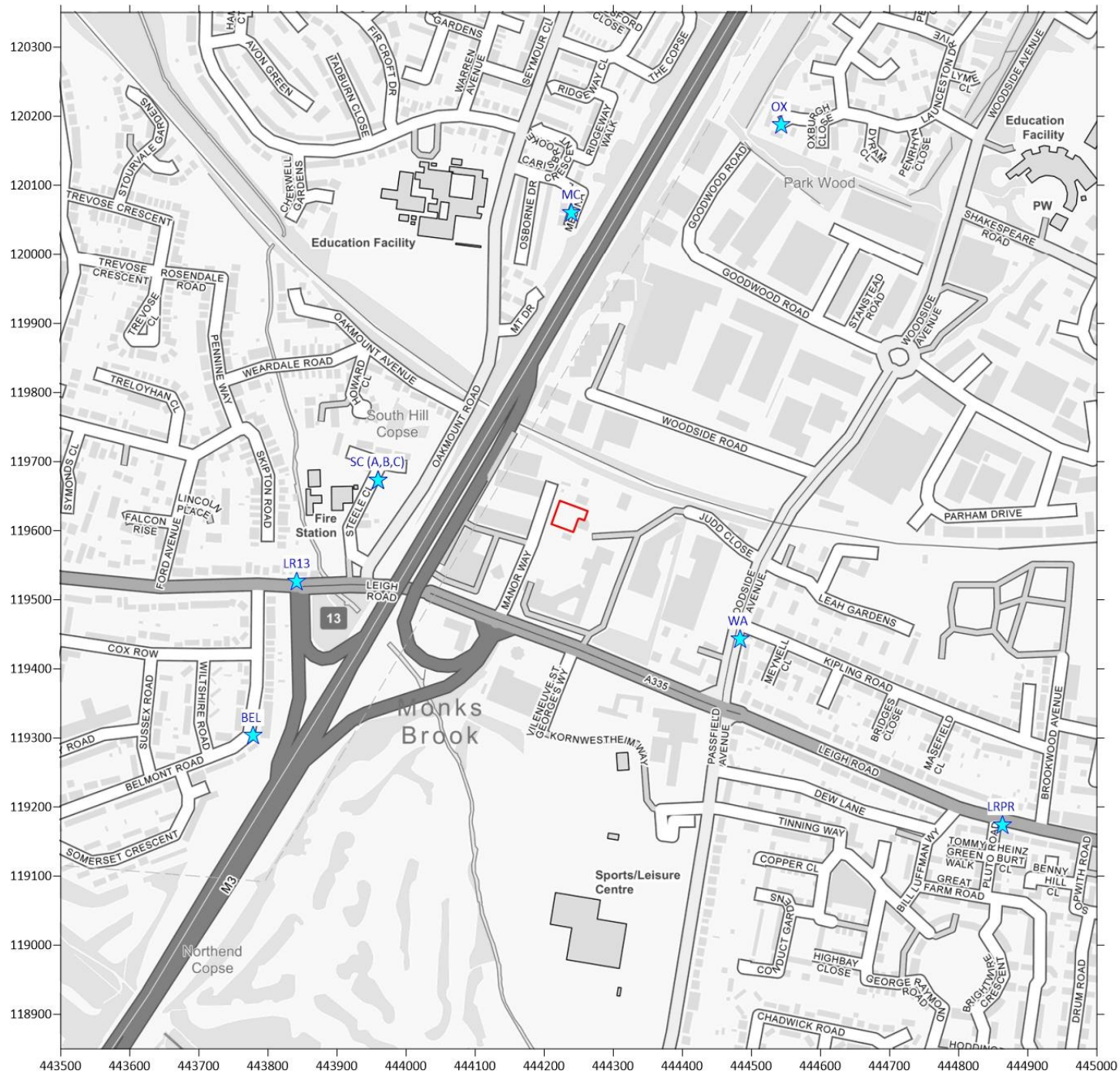
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Legend

-  Site Boundary
-  Monitor

Title

Figure 2 - Monitor Locations

Project

Air Quality Assessment
Leigh Road, Eastleigh

Project Reference

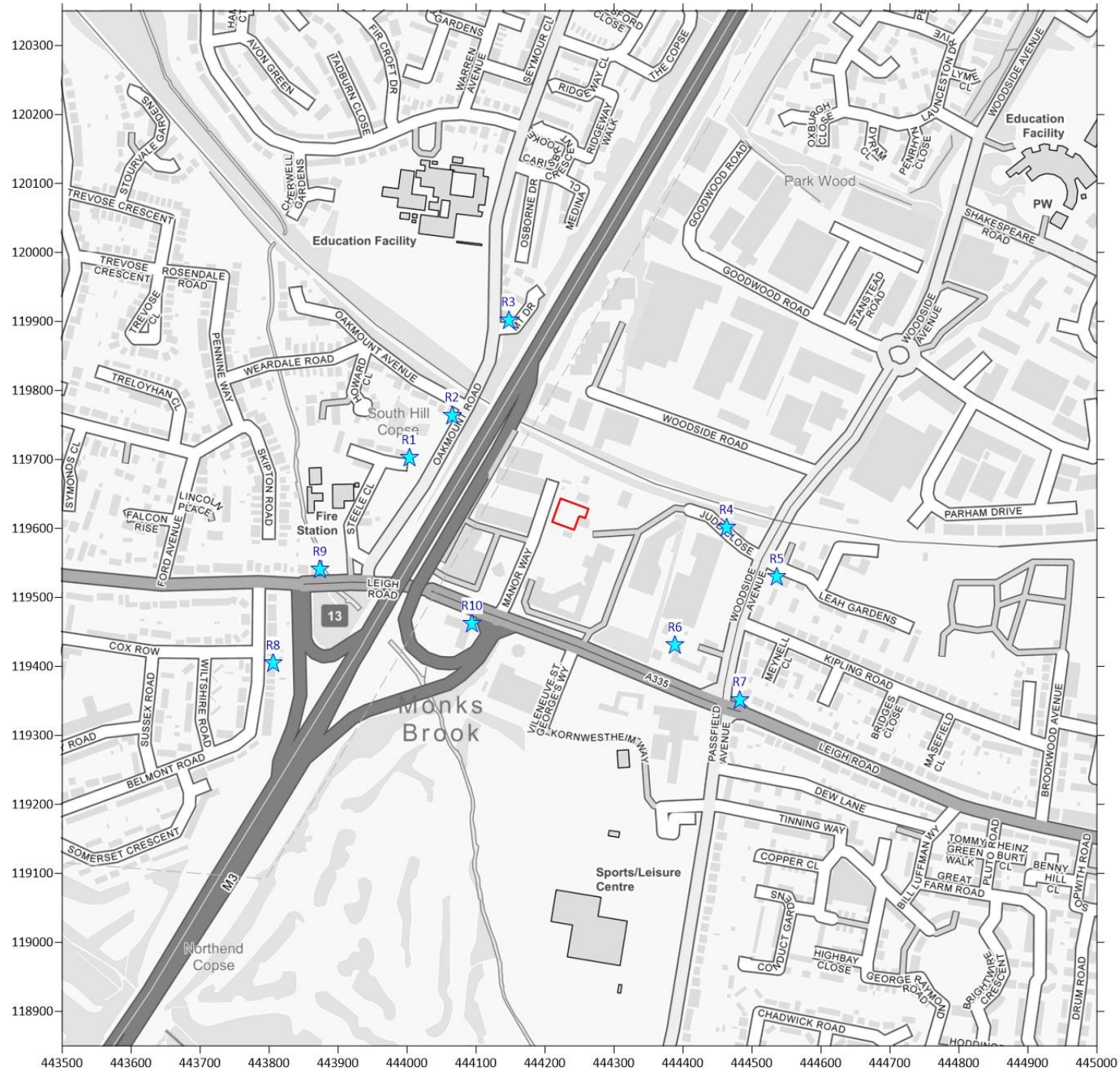
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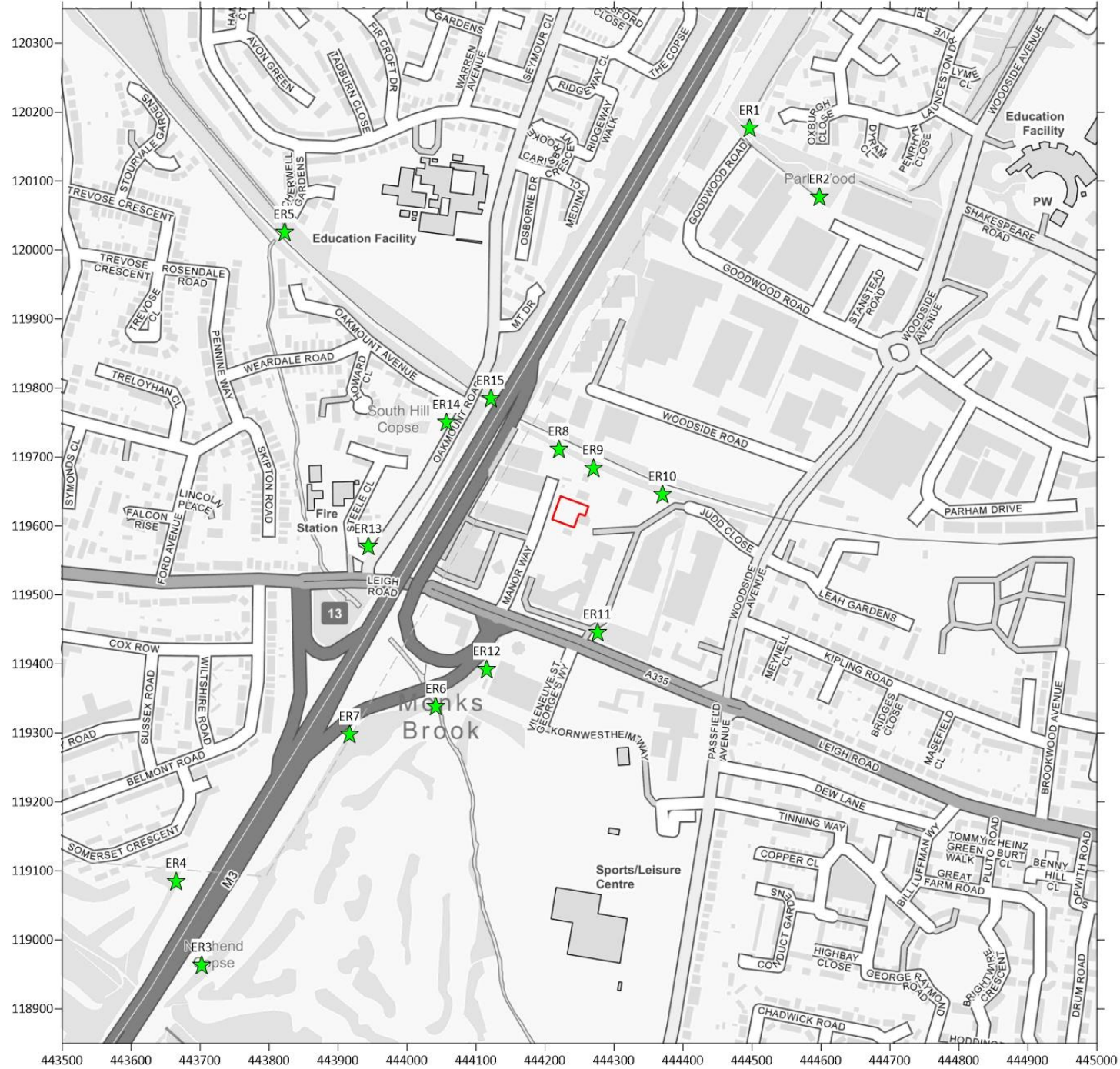
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Legend
 Site Boundary
 Human Receptor
Title Figure 3 - Sensitive Human Receptor Locations
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Legend



Site Boundary



Ecological Receptor

Title

Figure 4 - Sensitive Ecological Receptor Locations

Project

Air Quality Assessment
Leigh Road, Eastleigh

Project Reference

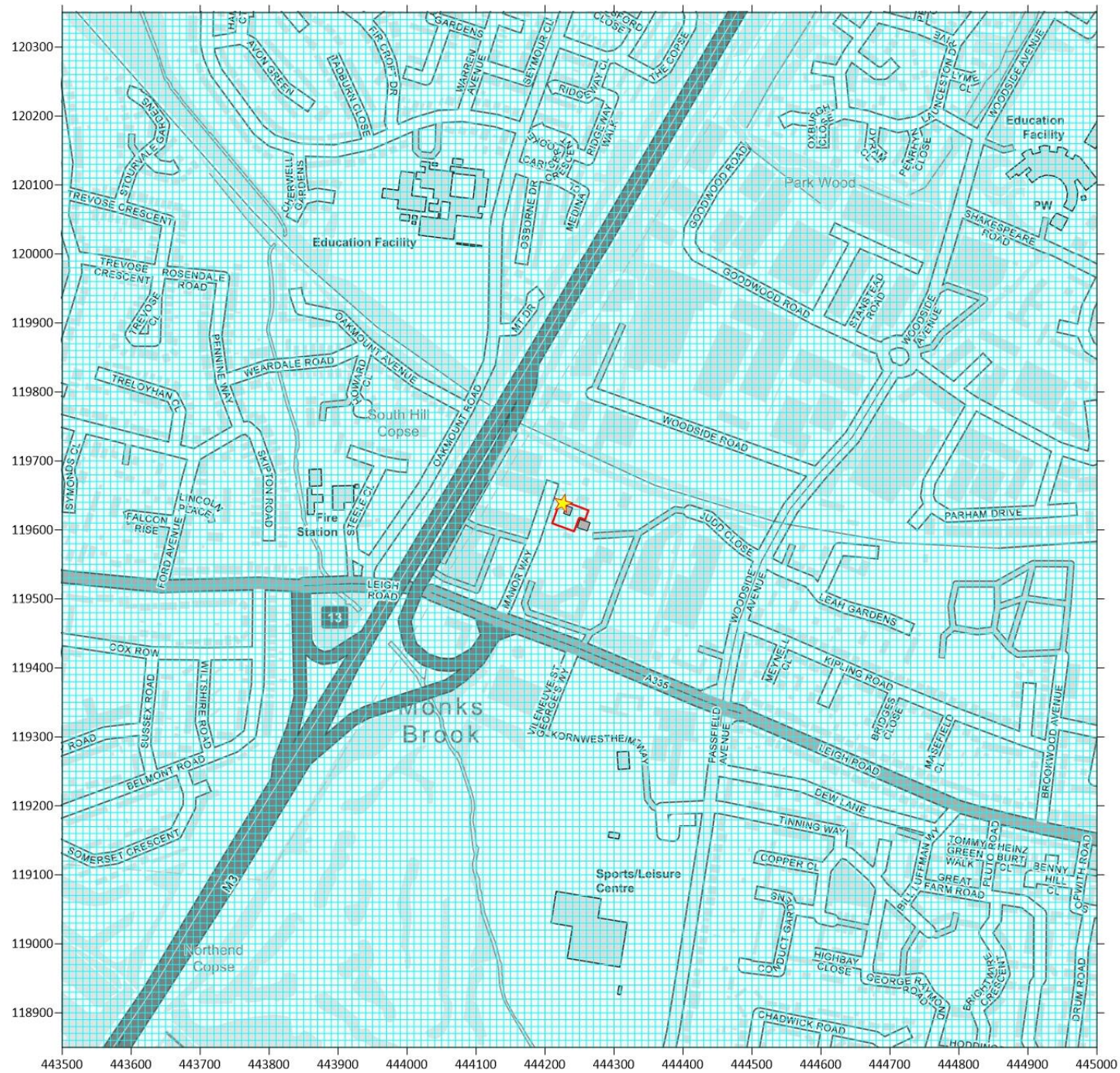
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Legend

-  Site Boundary
-  Stack
-  Output Grid
-  Building

Title

Figure 5 - ADMS-5 Inputs

Project

Air Quality Assessment
Leigh Road, Eastleigh

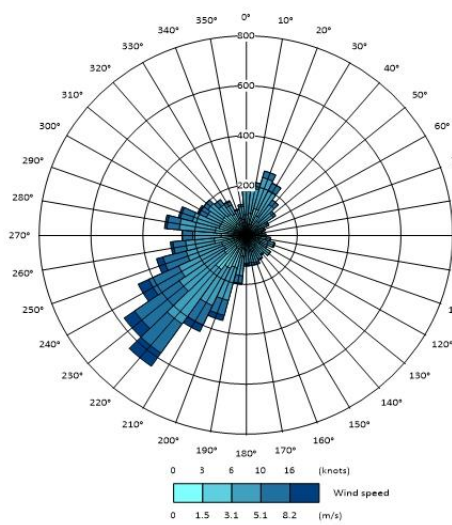
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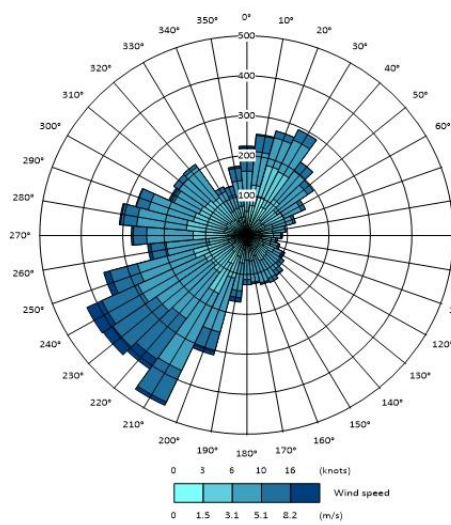
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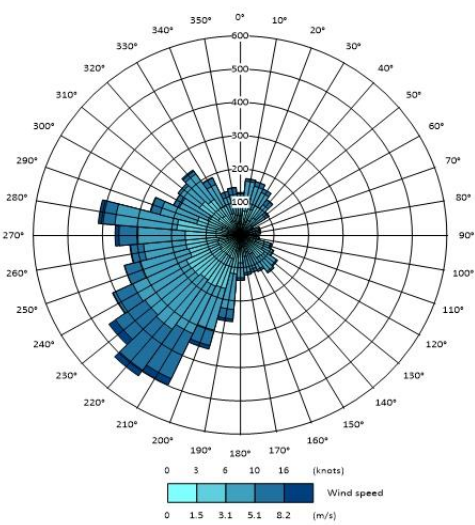
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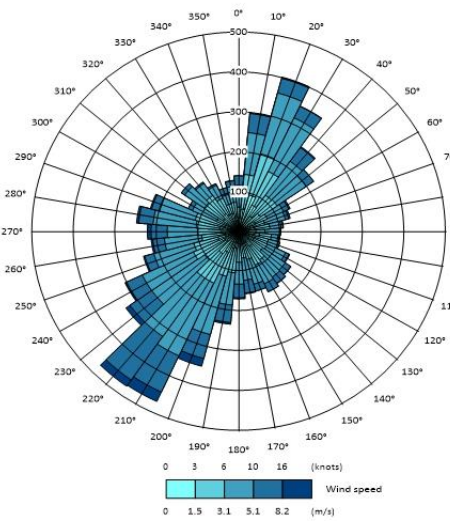
2015 Meteorological Data



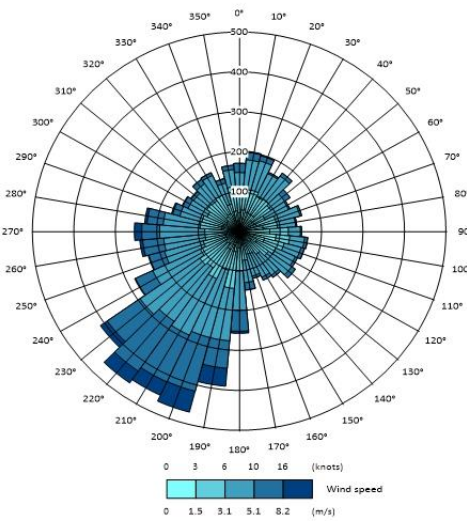
2016 Meteorological Data



2017 Meteorological Data



2018 Meteorological Data



2019 Meteorological Data

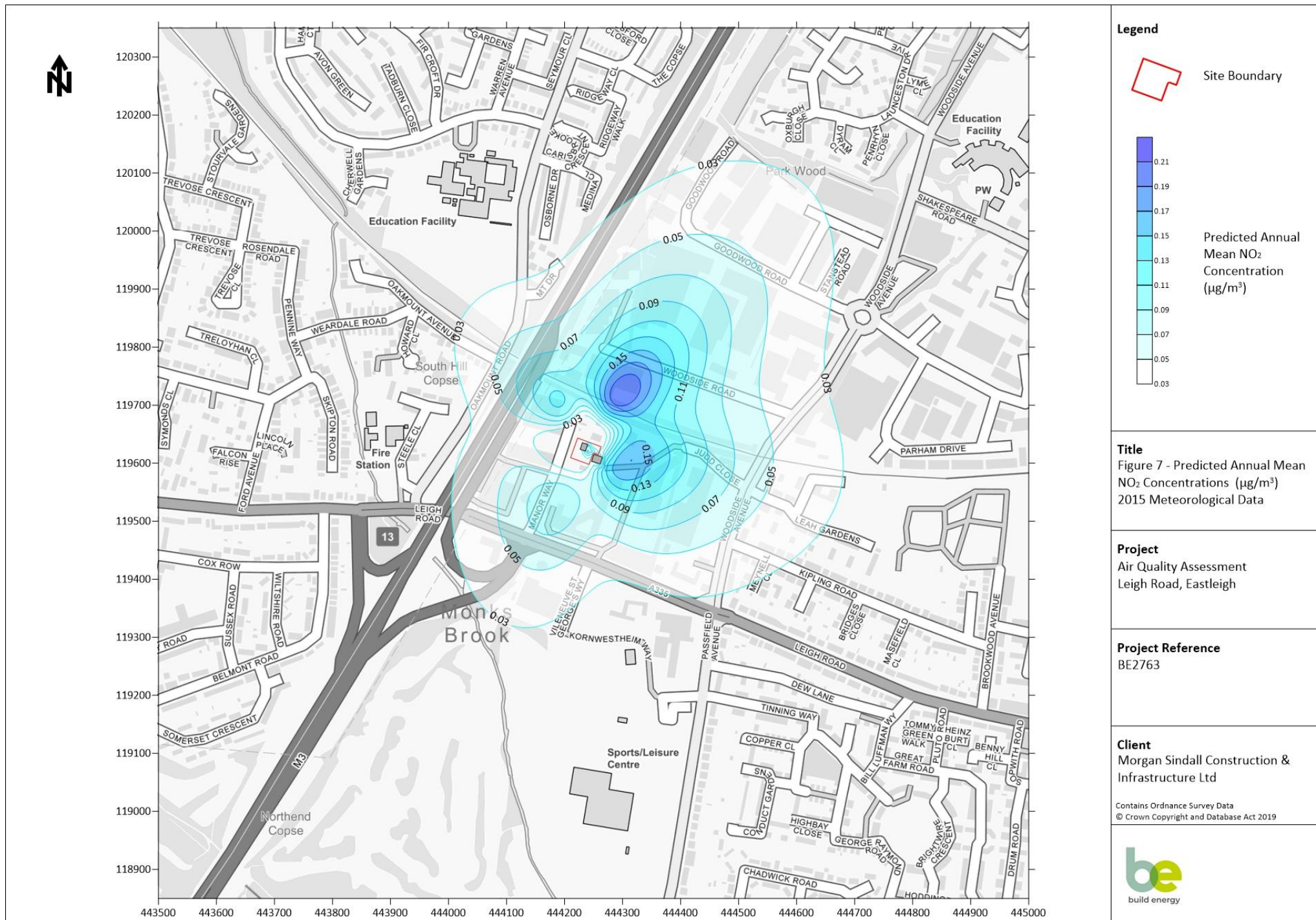
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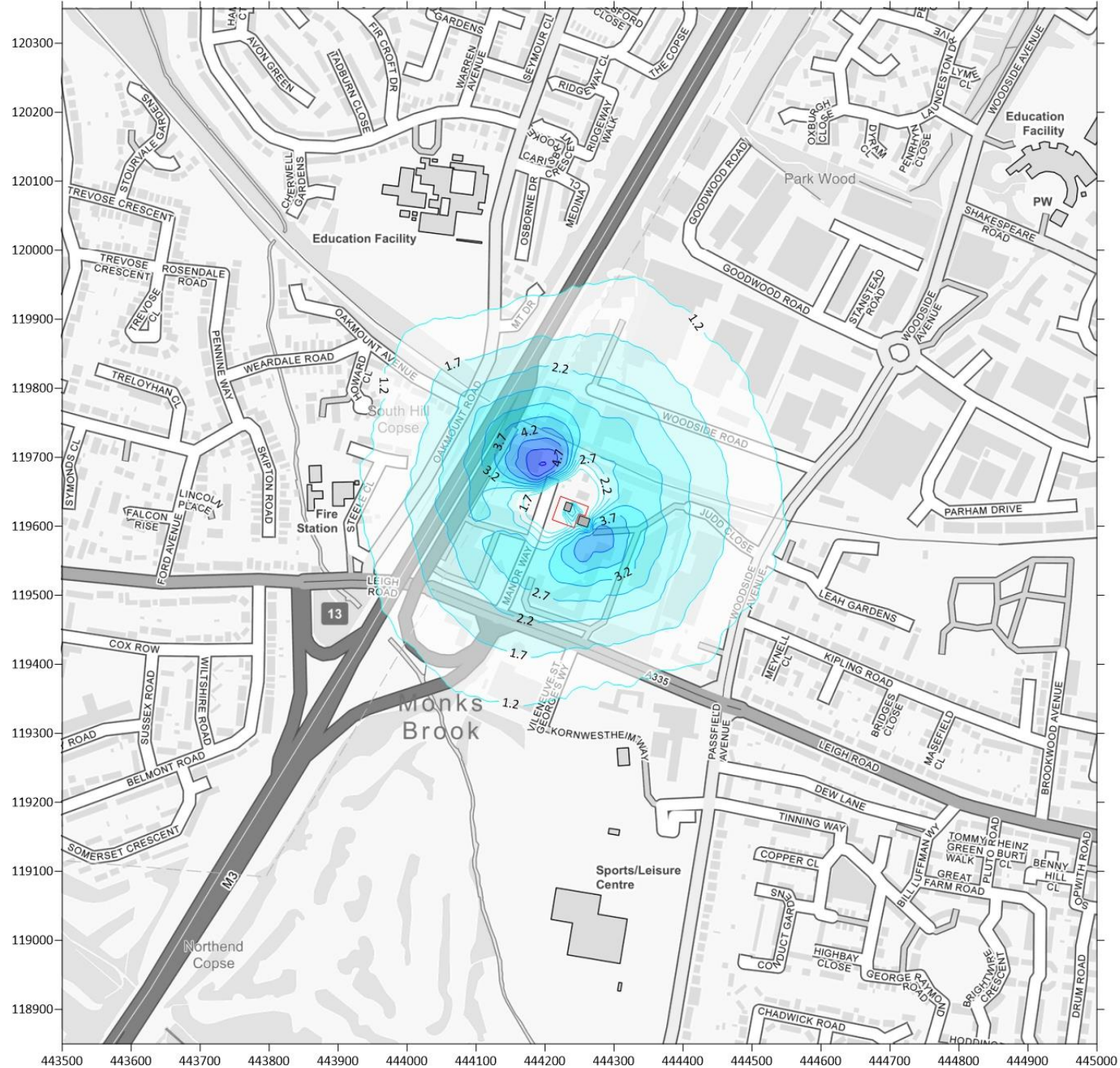
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Figure 6 - Wind Roses of 2015 to
2019 Southampton Airport
Meteorological Data

Project
Air Quality Assessment
Leigh Road, Eastleigh

Project Reference
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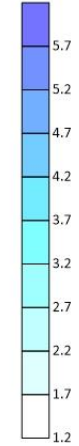




Legend



Site Boundary



Predicted 99.8th
%ile 1-hour
Mean NO₂
Concentration
(µg/m³)

Title

Figure 8 - Predicted 99.8th %ile
1-hour Mean NO₂
Concentration (µg/m³)
2018 Meteorological Data

Project

Air Quality Assessment
Leigh Road, Eastleigh

Project Reference

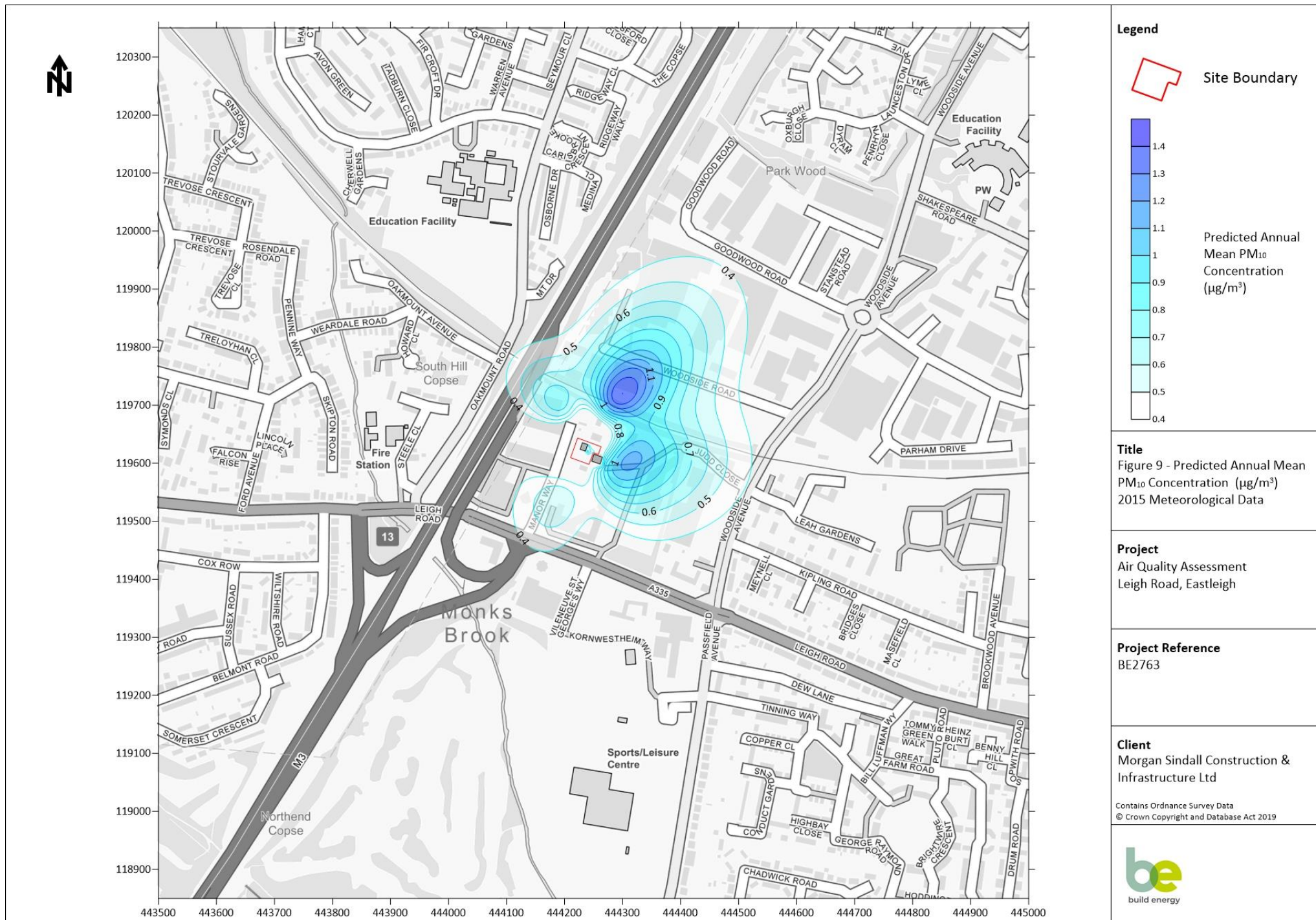
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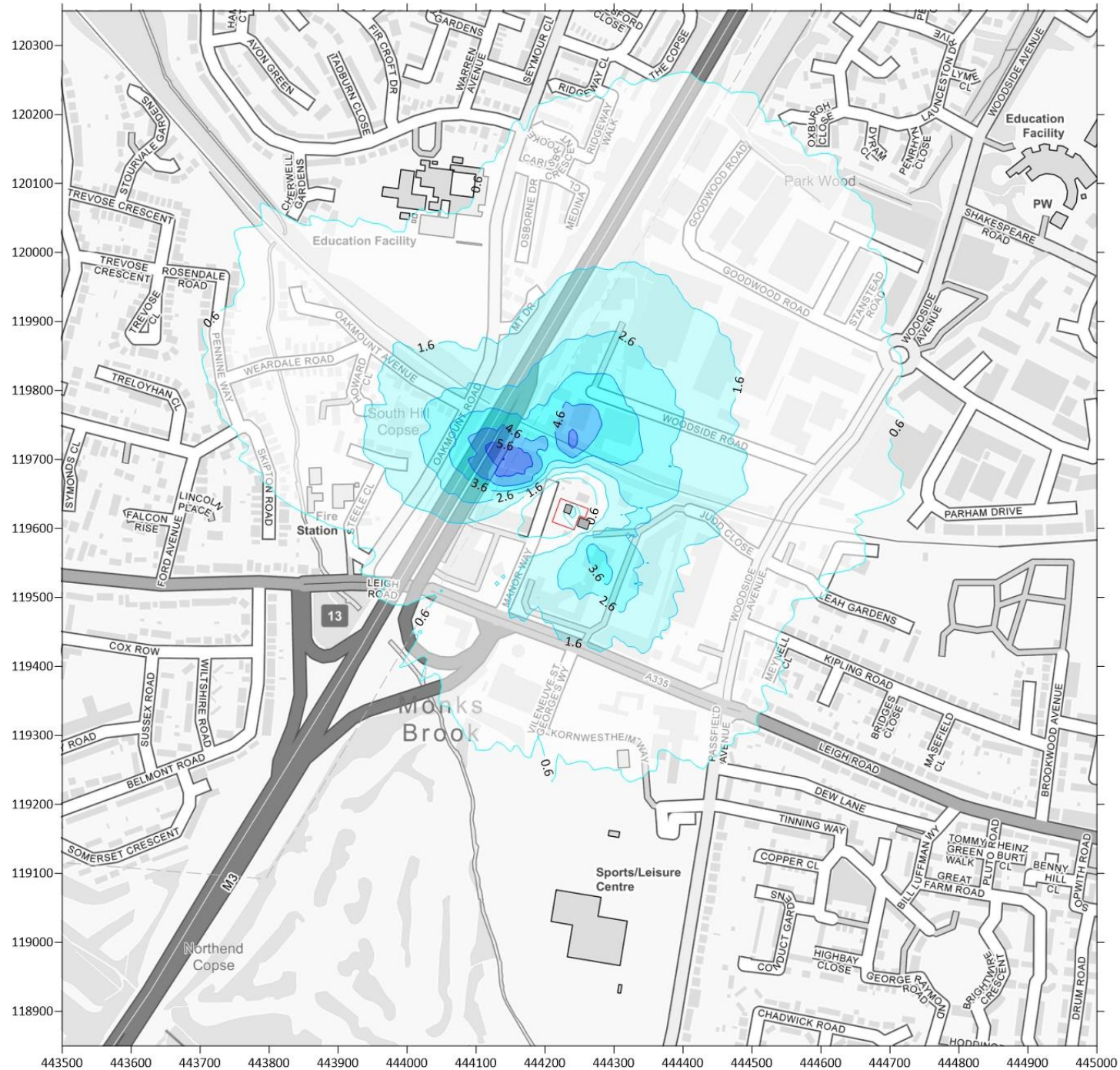
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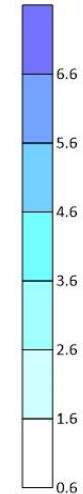




Legend



Site Boundary



Predicted 90.4th
%ile 24-hour
Mean PM₁₀
Concentration
(µg/m³)

Title

Figure 10 - Predicted 90.4th %ile
24-hour Mean PM₁₀
Concentration (µg/m³)
2019 Meteorological Data

Project

Air Quality Assessment
Leigh Road, Eastleigh

Project Reference

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