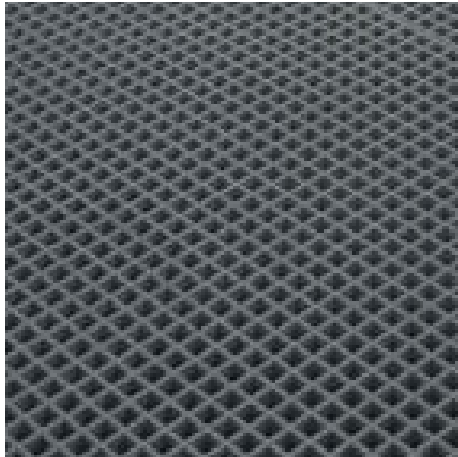




1. External Finish
Pre-Cast Concrete Slab



2. Gantry Platform
Expanded Metal Mesh - Steel or Aluminium
(Holes to be small enough to prevent equipment falling through)



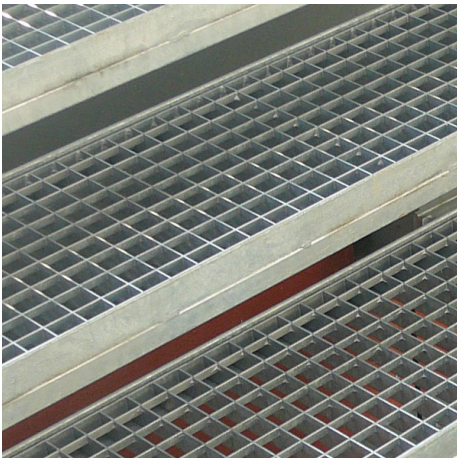
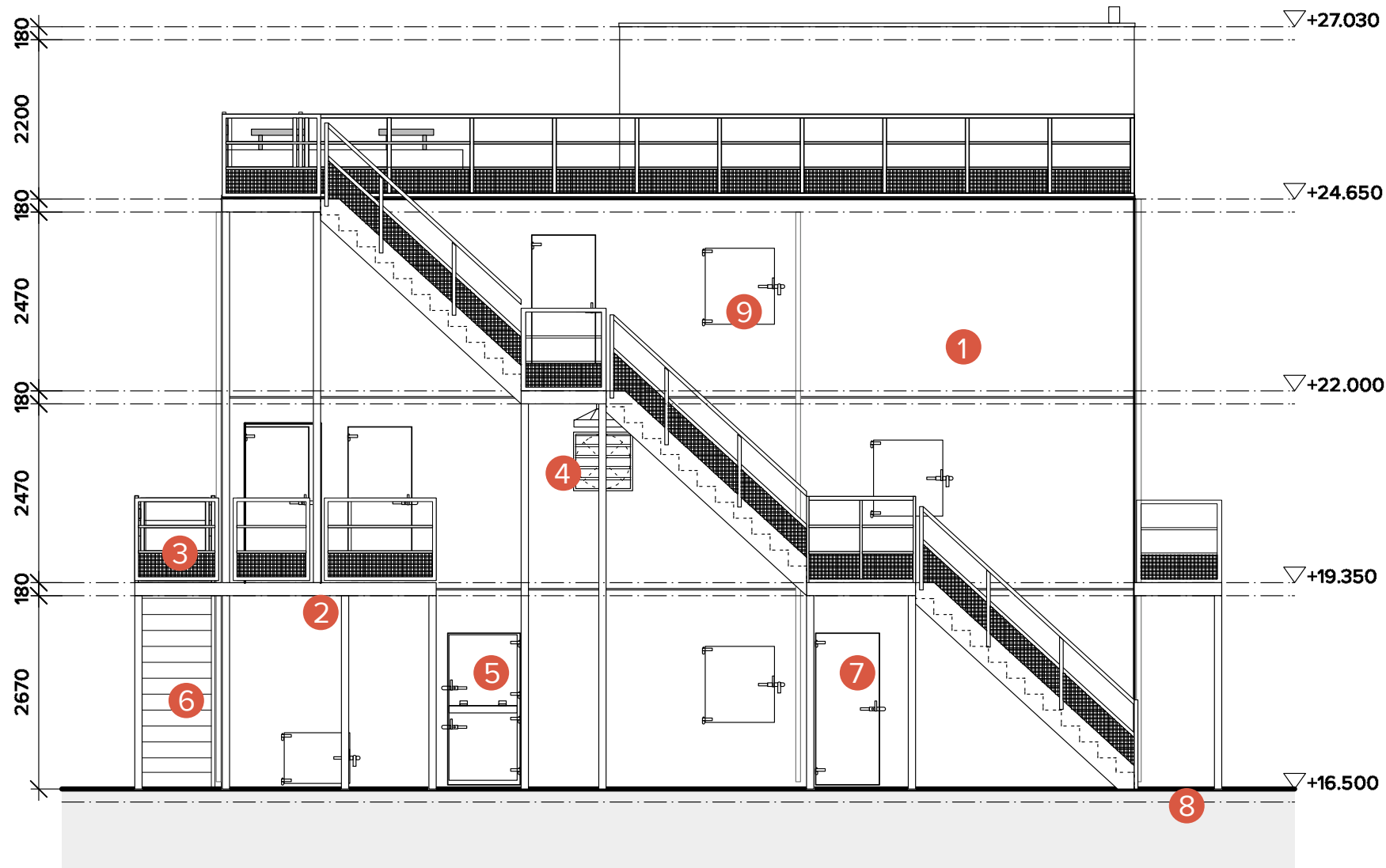
3. Gantry Balustrades and Handrails
Galvanised Steel - Mesh Kick Plate to
Bottom Run and Accompanying Toeboards



4. Grille / Vent Flues
Steel to Withstand Heat



5. 'Stable' Fire Door
Steel - Match Existing Fire House



6. Gantry Stairs
Expanded Metal Mesh - Steel or Aluminium
(Holes to be small enough to prevent equipment falling through)



7. Steel Fire Doors
Steel - Match Existing Fire House



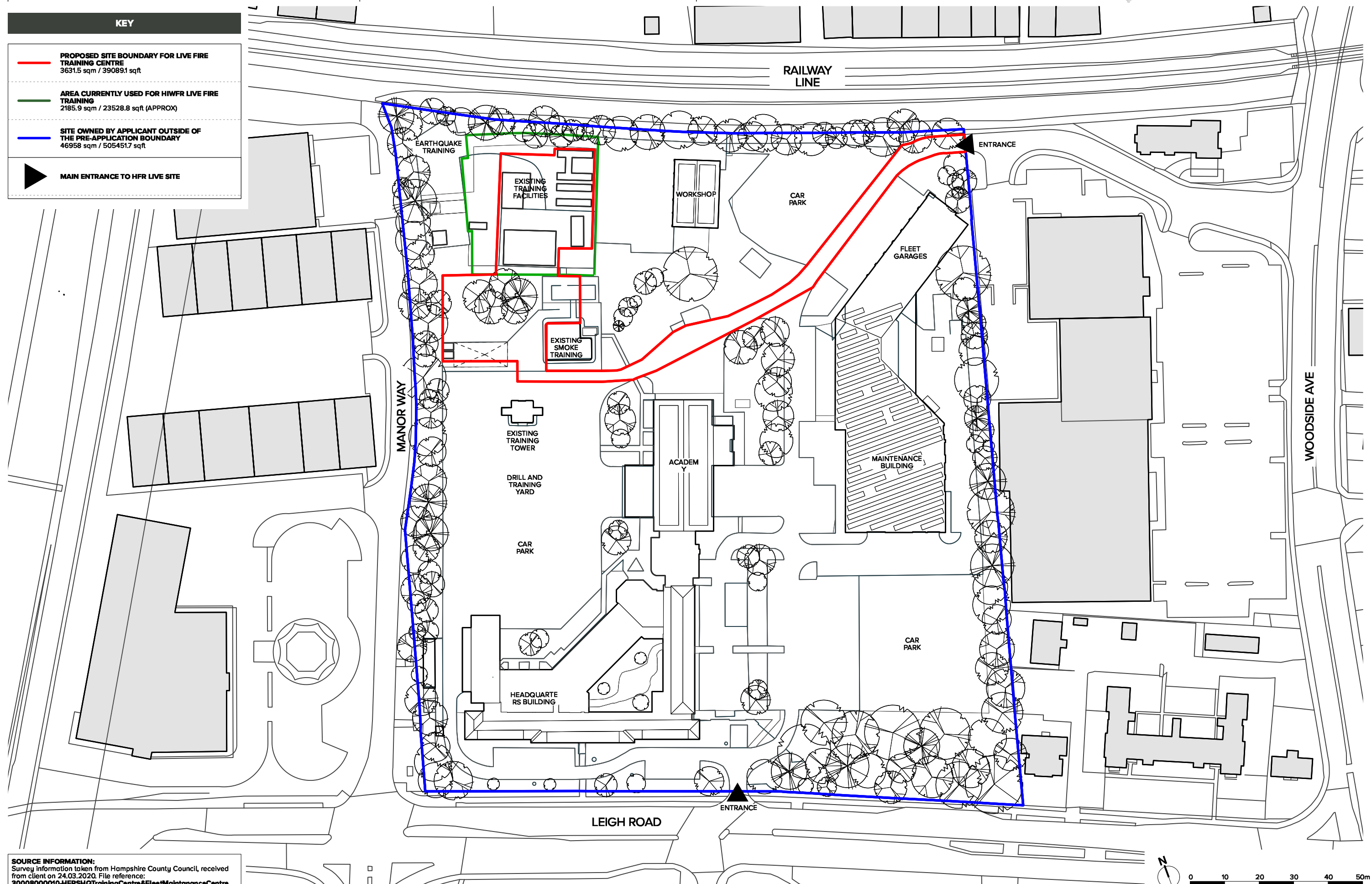
8. Tarmacadam



9. Windows
Windows to include Steel Seal-able
Hatches

KEY

- **PROPOSED SITE BOUNDARY FOR LIVE FIRE TRAINING CENTRE**
3631.5 sqm / 39089.1 sqft
- **AREA CURRENTLY USED FOR HIWFR LIVE FIRE TRAINING**
2185.9 sqm / 23528.8 sqft (APPROX)
- **SITE OWNED BY APPLICANT OUTSIDE OF THE PRE-APPLICATION BOUNDARY**
46958 sqm / 505451.7 sqft
- ▶ **MAIN ENTRANCE TO HFR LIVE SITE**



SOURCE INFORMATION:
Survey information taken from Hampshire County Council, received from client on 24.03.2020. File reference: 30008000010-HFRSHQTrainingCentre&FleetMaintenanceCentre.

Revisions: A MH JLS 13/07/2022 Planning Issue.

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Air Quality Assessment

Leigh Road, Eastleigh

Prepared on behalf of:

Morgan Sindall Construction & Infrastructure Ltd

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Issue	Issue Date	Written by	Checked by	Notes
VI	14/07/2022	Liam Shelmerdine		

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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 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 sensitive receptor location in the vicinity of the site.

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 (Ref: Q/20/87536) 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 of combustion gases. 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;
- 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 AQOs. These are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances 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 (TG16), DEFRA, 2021.

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
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 (as opposed to locations at the building façade) or any other location where public exposure is expected to be short term 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.

National Planning Policy

The revised National Planning Policy Framework³ (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 [...]."

³ NPPF, Ministry of Housing, Communities and Local Government, 2021.

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."

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

National Planning Practice Guidance

The National Planning Practice Guidance⁴ (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 - 2036⁵ was adopted 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:

i. 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.

⁴ <https://www.gov.uk/guidance/air-quality--3>.

⁵ 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 3. Exceedences of the relevant AQO are shown in **bold**.

Table 3 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 3, 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 4.

Table 4 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 4, 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 website⁶ for the purpose of the assessment and is summarised in Table 5.

Table 5 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 desk-top study was undertaken in order to identify any sensitive 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.

⁶ <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 receptor locations are summarised in Table 6.

Table 6 Sensitive 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 sensitive receptor locations.

Methodology

Introduction

Combustion emissions from the development have the potential to contribute to elevated pollutant concentrations in the vicinity of the site. These have been quantified through dispersion modelling in accordance with the methodology outlined in the following Sections.

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.

Modelling Scenarios

The scenarios considered in the modelling assessment are summarised in Table 7.

Table 7 Assessment Scenarios

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 7 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.

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.

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 4 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 8. These were provided by the Applicant.

Table 8 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 9.

Table 9 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 factors were obtained from the United States Environmental Protection Agency (US EPA) 'AP-42: Compilation of Air Emissions Factors' (AP-42). These are shown in Table 10.

Table 10 CO and NO_x Pollutant Emission Concentrations

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 9 and the flow rate shown in Table 8. The NO_x and CO emission rates shown in Table 10 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 11.

Table 11 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 AQO, to be assessed. Actual plant emissions of PM are unlikely to only consist of only one PM fraction, resulting in a worst-case 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) guidance⁷.

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 12.

Table 12 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

⁷ <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports>.

Existing Smoke Training Facility	444255.9	119607.0	7.2	12.6	15.4	198.4
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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 5 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 both the modelling extents and 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'.

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 CERC⁸.

Background Concentrations

Review of existing data in the vicinity of the site was undertaken in order to identify suitable background values for use in the assessment. These were subsequently utilised to represent existing concentrations at sensitive receptors in the vicinity of the site. A summary of relevant values is provided in Table 13.

Table 13 Background Pollutant Concentrations

Pollutant	Receptor	Background Pollutant Concentration Used in Model ($\mu\text{g}/\text{m}^3$)	Source	Justification

⁸ Note 105: Setting up Terrain Data for Input to CERC Models, CERC, 2016.

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		

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'⁹, 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

The significance of predicted air quality impacts at sensitive 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'¹⁰. 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 14.

Table 14 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 AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

⁹ Air emissions risk assessment for your environmental permit, EA, 2016.

¹⁰ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

The matrix shown in Table 14 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'¹¹, as summarised in Table 15.

Table 15 Significance of Impact - Short Term Concentrations

Predicted Concentration Change as a Proportion of AQO (%)	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.

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 normal operating conditions;

¹¹ Land-Use Planning & Development Control: Planning for Air Quality, IAQM, 2017.

- 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 and DEFRA mapping study. 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 AQOs. 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 6 to 10 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 6 were produced from these outputs.

Nitrogen Dioxide

Annual mean NO₂ PECs at the sensitive receptors, inclusive of background levels are summarised in Table 16.

Table 16 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 16, NO₂ PECs were below the annual mean AQO of 40µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 6 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 17. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 17 Predicted Impacts on Annual Mean NO₂ Concentrations

	Receptors	Predicted Concentration (PEC)	Predicted Concentration as Proportion of AQO (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 17, 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, inclusive of background levels are summarised in Table 18.

Table 18 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 18, 99.8th %ile 1-hour NO₂ PECs were below the AQO of 200µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 7 for a graphical representation of predicted 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 19. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 19 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 19, 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, inclusive of background levels are summarised in Table 20.

Table 20 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 20, PM₁₀ PECs were below the annual mean AQO of 40µg/m³ at all sensitive receptor locations for all meteorological data sets.

Reference should be made to Figure 8 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 21. These consider the maximum predicted change in concentration from the five meteorological datasets as a worst-case.

Table 21 Predicted Impacts on Annual Mean PM₁₀ Concentrations

	Receptors	Predicted Concentration (PEC)	Predicted Concentration as Proportion of AQO (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 21, 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, inclusive of background levels are summarised in Table 22.

Table 22 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