Air Quality Impact Assessment Report

LON1XO – Slough Data Centre

Yondr Group Limited

19/06/2023
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1 Introduction

Sweco UK has been commissioned by Yondr ('Client') to undertake an air quality assessment in support of an application for an Environmental Permit for the operation of emergency back-up generators at the proposed development named SLO1 located off Wexham Road, Slough (the 'Site').

The proposals comprise two 30MW IT capacity (MWit) data centre buildings with associated substation and mechanical yard. Each building (named A & B) will include three storeys of data halls and facility support (offices and ancillary space), and a four-storey external gantry where most of the external plant will be located along with 26 No 2.4MW generators per building (the 'Proposed Development'). At this stage, it is also likely that a data centre use will come forward on 'Block J' area (i.e. the remaining commercial plot on the approved Parameter Plan). This future development for further data centre is referred to as 'Building C' and is estimated to comprise of 34 No 2.2MW generators (details to be confirmed in late 2023).

This air quality assessment predicts the emissions to air from the operation of the emergency back-up generators included within the Proposed Development. The scenarios assessed include the routine testing and maintenance along with the emergency operations to provide back-up electricity supply during outages.

An Environmental Permit application is being submitted to the Environment Agency. This document should be read in conjunction with the Environmental Permit Application (Ref- EPR/NP3829SP/A001), which contains full details of the Site's installation activities, the operating techniques and the engine emissions standards that will be implemented at the Proposed Development.

2 Site Location and Proposed Development

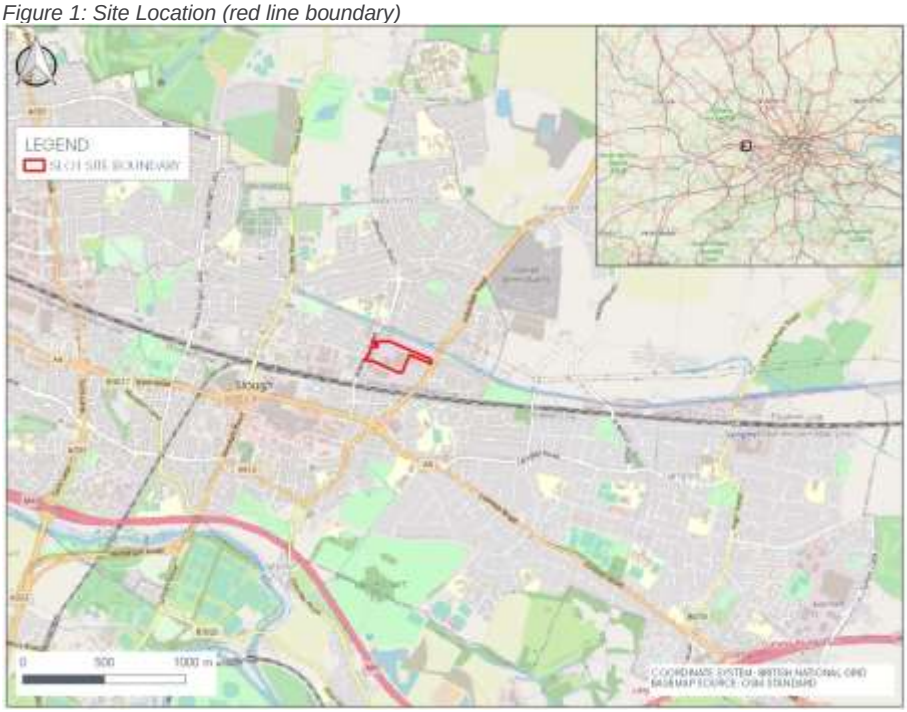
2.1 Site Description

The Site is located to the east of Wexham Road and falls within the jurisdiction of Slough Borough Council (SBC). The surrounding area is a mixture of commercial and residential developments. The Site forms part of a wider development which will see additional residential properties constructed to the south of the Proposed Development.

An outline planning permission has been granted for the former Akzonobel Paintworks Factory site in Slough, including the provision of provision of commercial floorspace including the Proposed Development. Pursuant to the outline approval, reserved matters submissions made on behalf of Yondr for the first phase of commercial development on part of the site were made and consented.

Figure 1 presents the red line boundary for the Proposed Development.

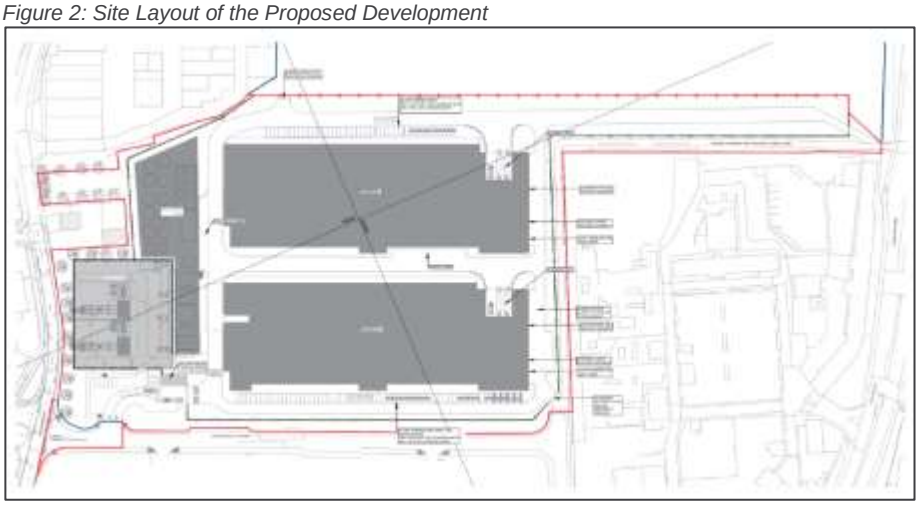
Figure 1: Site Location (red line boundary)



2.2 Proposed Development

The Proposed Development comprises the demolition of the existing site buildings, and the construction of two 30MWit data centre buildings with associated substation and mechanical yard. Each building (A & B) will include three storeys of data halls and facility support (offices and ancillary space), and a four-storey external gantry where most of the external plant will be located. The Proposed Development site plan is presented in Figure 2.

Figure 2: Site Layout of the Proposed Development



Most of the external plant will be located on an external gantry to the north of the data halls. The proposed gantry layouts and sections are shown in Figures 3 to 7 below.

Figure 3: Ground Floor Gantry Layout (Generator Layout) – Buildings A & B

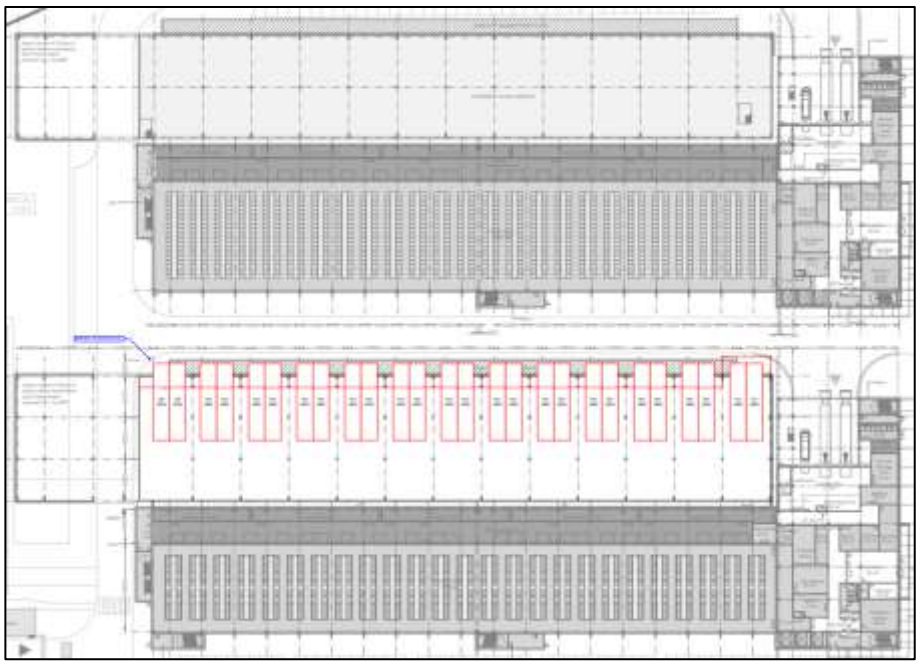


Figure 4: First Floor Gantry Layout (CEP Layout) – Buildings A & B

Figure 5: Second Floor Gantry Layout (CEP Layout) – Buildings A & B

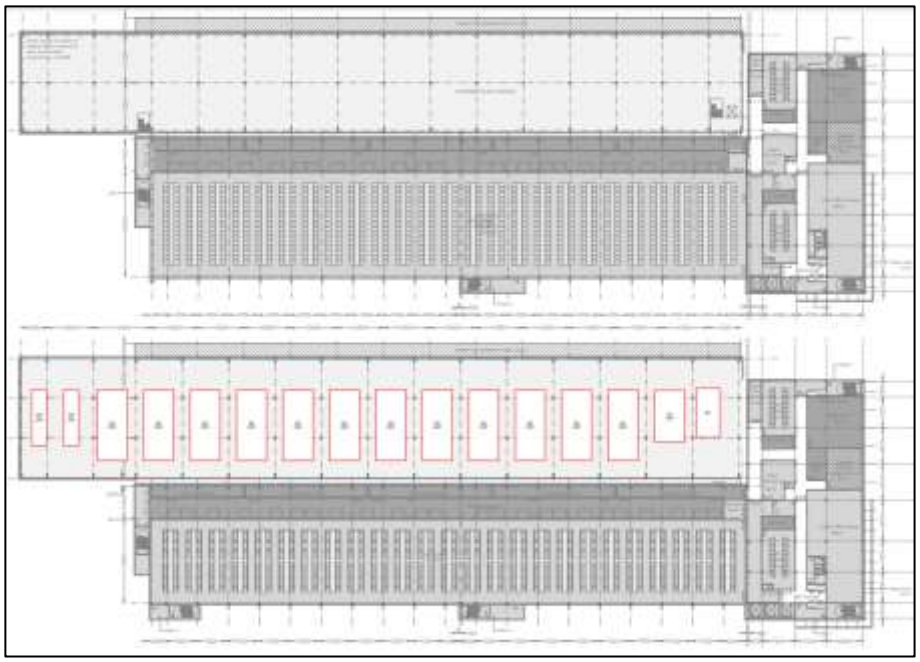


Figure 6: Third Floor Gantry Layout (Chiller Layout) – Buildings A & B

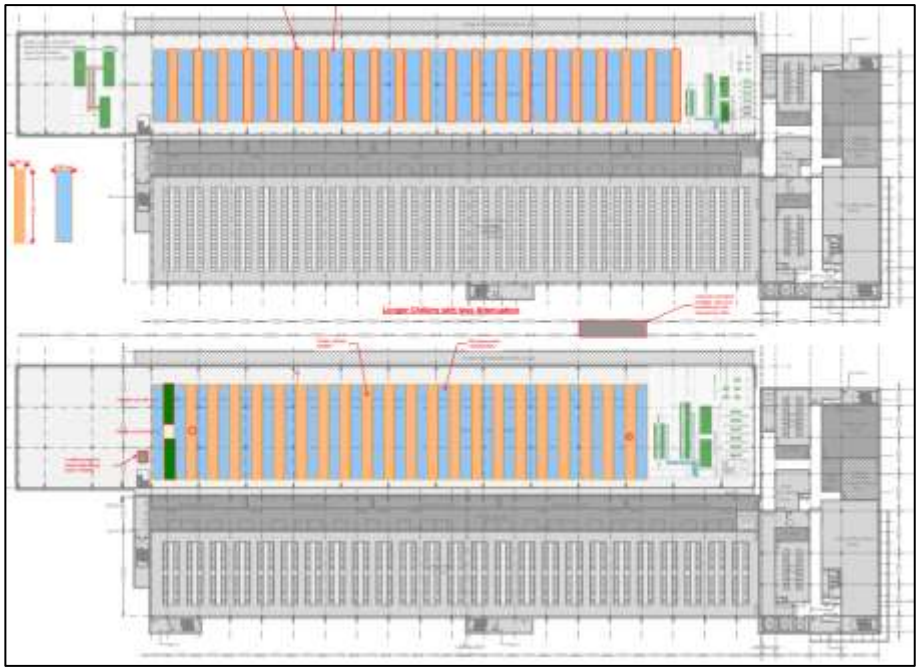
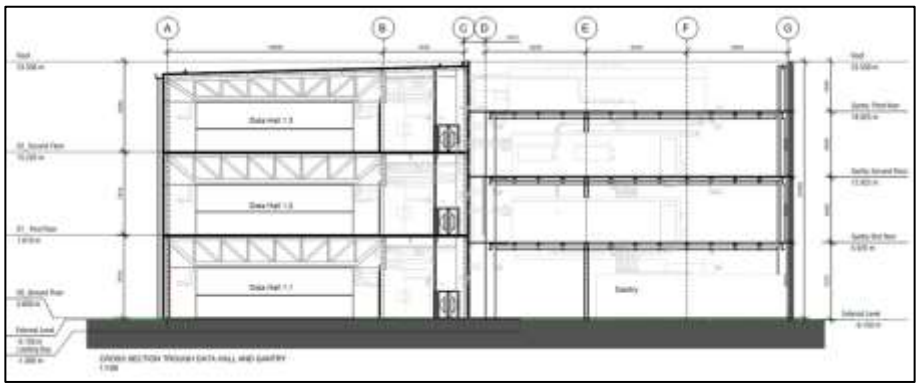


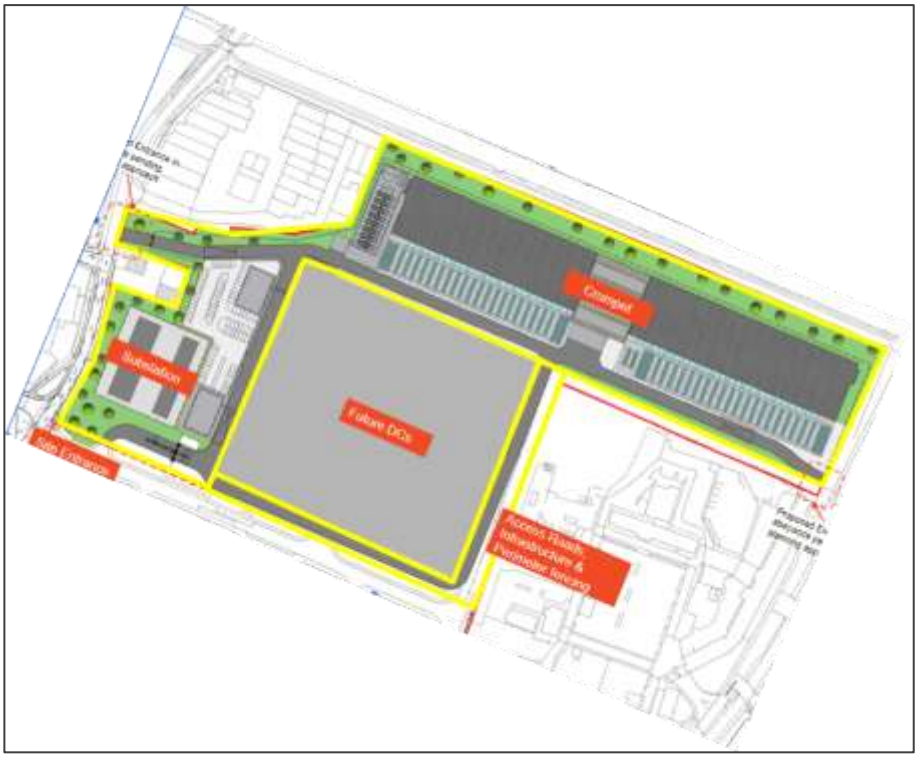
Figure 7: Gantry Section – Buildings A & B



2.3 Future Phase

The future phase of development to the north, Building C, is likely to comprise further data halls and associated gantries. Although **this phase of the development does not form part of this permit application**, to adopt a worst-case approach, emissions from generators that would be associated with Building C have been modelled within an 'in-combination' assessment to understand if the total emission burden could potentially exceed the relevant environmental assessment levels at identified sensitive receptors. The approximate location of generator stacks and structures within Building C have been included within the air quality modelling.

Figure 8: Layout of Building C (in relation to Proposed Development)



3 Policy, Standards, and Guidance

The policy applicable to the air quality assessment is summarised below.

3.1 Air Quality Standards

The UK's legislation and regulatory regime, along with national, regional and local planning policy play a key role in the prevention, control and minimisation of atmospheric emissions that are potentially harmful to human health and the environment. Air Quality Objectives (AQOs) are quality standards for clean air that are used as assessment criteria for determining the significance of any potential changes in local air quality resulting from development proposals.

3.1.1 Environment Act

Part IV of the Environment Act 1995[1] places a duty on the Secretary of State for the Environment to develop, implement and maintain an Air Quality Strategy with the aim of reducing atmospheric emissions and improving air quality. An amendment, the Environment Act 2021[2], was subsequently brought into law in November 2021. Schedule 11 of this Act makes it clear that it remains a requirement for local authorities to periodically review and document local air quality with the aim of meeting the air quality objectives defined in the Air Quality Regulations. Where a local authority determines that one or more objective is unlikely to be achieved it is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority must produce an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

3.1.2 Air Quality Regulations

The Air Quality (England) Regulations 2000[3] (as amended) set the objectives for ambient pollutant concentrations. The objectives apply where there is relevant exposure: "*at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present*…".

The Air Quality Standards Regulations[4] (as amended) and the Environment (Miscellaneous Amendments) (EU Exit) Regulations[5] set legally binding (mandatory) limit values for concentrations in outdoor air of major air pollutants that impact public health including nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM_{10} and $PM_{2.5}$). The Regulations also include critical levels for the protection of vegetation. The limit values are numerically the same as the objectives.

[1] Environment Act 1995, Chapter 25, Part IV Air Quality
[2] The National Archives (2021) Environment Act 2021
[3] The National Archives (2000) The Air Quality (England) Regulations 2000
[4] The National Archives (2010) The Air Quality Standards Regulations 2010
[5] The National Archives (2020) The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020

3.1.3 Environmental Permitting Regulations (EPR) & Industrial Emissions Directive (IED)

Directive 2010/75/EU[6] on industrial emissions (integrated pollution prevention and control) (IED) recast seven directives related to industrial emissions, in particular Directive 2008/1/EC concerning integrated pollution prevention and control (IPPC)[7] and Directive 2001/80/EC[8] emissions from large combustion plants (LCPD), into a single legislative instrument. The aim of the IED was to improve the permitting, compliance and enforcement regimes adopted by Member States to the European Union.

The Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016)[9], as amended, consolidated and replaced the EPR 2010 and subsequent amendments. The EPR 2016 is the main implementing regulations for the environmental permitting regime and transposed the requirements of the IED into UK legislation.

The Medium Combustion Plant Directive (Directive 2015/2193) (MCPD)[10] filled the regulatory gap between Large Combustion Plant (LCP) and certain small combustion plant covered by the Ecodesign Directive (2009/125/EC)[11].

The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 SI 110 (EPR 2018)[12] transposed the requirements of the MCPD into legislation and introduced requirements for the control of emissions from 'Specified Generators'.

The Proposed Development generators are excluded from the specified generator controls given that they will be used for on-site emergency back-up only during grid failure and will not form part of a formal agreement or contract.

3.1.4 Conservation of Habitats and Species Regulations 2010

The European Habitats Directive (92/43/EEC)[13] sets out the legal framework requiring EU member states to protect habitat sites supporting vulnerable and protected species, as listed within the Directive. This Directive is transposed into UK law by the Conservation of Habitats and Species Regulations 2010[14] and requires protection of ecological sites including Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).

[6] EUR-Lex (2010) Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)
[7] EUR-Lex (2008) Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integration pollution prevention and control
[8] EUR-Lex (2001) Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants
[9] The National Archives (2016) The Environmental Permitting (England and Wales) Regulations 2016 Statutory Instrument No. 1154
[10] EUR-Lex (2015) Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants
[11] EUR-Lex (2009) Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products [
[12] The National Archives (2018) The Environmental Permitting (England and Wales) (Amendment) Regulations 2018
[13] EUR-Lex (1992) Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
[14] The National Archives (2010) The Conservation of Habitats and Species Regulations 2010 Statutory Instrument No. 490

The relevant standards and guidelines that provide a framework for assessing impacts on sensitive ecological receptors are derived from several sources:

- air quality standards for NO_x (annual mean) for the protection of habitats are derived from the Ambient Air Quality Directive[15], as mirrored in the Air Quality Standards Regulations 2010[4];
- air quality guidelines for NO_x (24 hours mean) have been derived by the Centre for Ecology and Hydrology (CEH) and are set out in Environment Agency Guidance[16]; and
- guidelines for the assessment of acid and nutrient nitrogen deposition as set out in the UK Air Pollution Information Service (APIS) website[17].

Based on the above legislative framework and guidance, relevant critical levels (that relate to airborne pollutants) and site-specific critical loads (that relate to deposition of materials to soils) have been established. These values represent the environmental criteria used in this assessment.

3.1.5 Air Quality Assessment Levels

The air quality assessment criteria applicable to this assessment are presented in Table 3.1, in relation to both human health and ecosystems.

The site-specific critical loads for nutrient nitrogen deposition and acid deposition are provided in Table 4.4 for the relevant sensitive ecological receptors included in this assessment.

Table 3.1: Relevant air quality assessment levels

Pollutant	Concentrations	Measured As
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times per year	One hour mean
	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3 not to be exceeded more than 35 times per year	24 hour mean
	40µg/m^3	Annual mean
Oxides of Nitrogen (NO_x)*	75µg/m^3	Daily mean
	30µg/m^3	Annual mean
Carbon Monoxide (CO)	10,000 µg/m^3	Maximum daily running 8 hour mean
Sulphur Dioxide (SO_2)	266 µg/m^3 not to be exceeded more than 35 times a year	15 minute mean

[15] EUR-Lex (2008) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleanair for Europe
[16] Environment Agency (2016) Air emissions risk assessment for your environmental permit, available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#page-navigation
[17] Centre for Ecology and Hydrology (2010) UK Air Pollution Information Service http://www.apis.ac.uk/

Pollutant	Concentrations	Measured As
	350 µg/m^3 not to be exceeded more than 24 times a year	1 hour mean
	125 µg/m^3 not to be exceeded more than 3 times a year	24 hour mean
*** - Applicable to ecological receptors only**		

3.2 Air Quality Guidance

The below guidance issued by relevant institutions or Agencies in the UK have been referred to in the undertaking this assessment is provided below.

i. Air emissions risk assessment for your environmental permit by Environment Agency (EA)[18]
ii. Environmental permitting: air dispersion modelling reports by Environment Agency (EA)[19]
iii. A guide to the assessment of air quality impacts on designated nature conservation sites by Institute of Air Quality Management (IAQM)[20]

[18] Available at https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[19] Available at https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports

[20] Holman et al (2019). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf

4 Scope and Methodology

4.1 Overview

This section details the scope of the assessment and basis of the methodology used for the assessment.

4.2 Study Area

The assessment considers the sensitivity and potential impacts of the Proposed Development on ecological and human receptors that may be exposed to emissions from the generator flues associated with the Proposed Development.

The receptor locations for the assessment have been identified based on the size, location and operational regime of the Proposed Development. A study area of approximately 5kms radius, centred on the Proposed Development site, has been selected to identify appropriate receptors (human and ecological).

The Site lies approximately 380m from parts of the Slough AQMA, declared for exceedances of the annual mean NO_2 objective, principally relating to traffic pollution in the area. The predominant source of pollution in the Study Area is emissions from traffic and light industrial. Heathrow Airport is located approximately 7 kms from the Proposed Development site.

4.2.1 Modelled Discrete Sensitive Human Health Receptors

The term 'sensitive receptors' includes any persons, locations or systems that may be susceptible to changes in air quality due to the operation of the generators associated with the Proposed Development.

Impacts have been modelled at the specified discrete receptor locations as detailed in Table 4.1 and depicted in Figure 9.

Table 4.1 Discrete receptor Locations

ID	Receptor	Description	OS GR X (m)	OS GR Y (m)	Receptor Height (m)
R1	Princes Street	Human	498552	179808	1.5
R2	Hazelmere Road	Human	499037	180364	1.5
R3	Yew Tree Road	Human	498499	179731	1.5
R4	Wexham Road	Human	498394	179849	1.5
R5	Apsley House	Human	498138	179920	1.5
R6	Cornwall House	Human	497501	179974	1.5
R7	Claycoats School	Human	496943	180043	1.5
R8	Windmill Care Centre	Human	496506	180184	1.5
R9	Tuns Lane	Human	496366	179928	1.5
R10	Paxton Avenue	Human	496124	179253	1.5
R11	Spackmans Way	Human	496237	179200	1.5

ID	Receptor	Description	OS GR X (m)	OS GR Y (m)	Receptor Height (m)
R12	Slough and Eton CoE Business and Enterprise College	Human	496869	179191	1.5
R13	Windsor Road	Human	497374	179439	1.5
R14	Saint Mary's Church of England Primary School	Human	498281	179425	1.5
R15	16 John Taylor Court	Human	496426	180162	1.5
R16	19 Farnham Road	Human	496351	180331	1.5
R17	49 Stoke Road	Human	497718	180412	1.5
R18	50 Stoke Road	Human	497772	180431	1.5
R19	100 Wexham Road	Human	498547	180361	1.5
R20	98 Broadmark Road	Human	499099	180430	1.5
R21	25 Cannon Gate	Human	499345	180876	1.5
R22	27 Clifton Road	Human	498623	179672	1.5
R23	Slough AQMA	AQMA	498611.7	179827	1.5
R24	South Bucks AQMA	AQMA	501491.1	180208.1	1.5
PR1	New Residential Development (South of the Site)	Human	498491.5	180241.5	1.5
PR2		Human	498537.6	180222.1	1.5
PR3		Human	498551.8	180201.6	1.5
PR4		Human	498602.5	180180.8	1.5
PR5		Human	498621.9	180172.9	1.5
PR6		Human	498671.5	180152.4	1.5
PR7		Human	498690.5	180144.8	1.5
PR8		Human	498740.5	180124	1.5
PR9		Human	498551.5	180133	1.5
PR10		Human	498621.9	180103.9	1.5

Figure 9: Discrete Receptors included within the Assessment

4.2.2 Gridded Receptors

The modelling includes a receptor grid extent of 2km by 2km with 30m spacing. Pollutant exposure isopleths have been generated by interpolation between receptor points. This method allows the maximum ground level concentration to be assessed across the study area.

4.2.3 Sensitive Ecological Receptors and Designated Habitats

The presence of the following protected sites have been screened within the study area:

- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs);
- Ramsar Sites designated under the Convention on Wetlands of International Importance[21];
- Sites of Special Scientific Interest (SSSI);
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local Wildlife Sites; and
- Ancient Woodland.

[21] The Convention of Wetlands of International Importance especially as Waterfowl Habitat 1971 (The Ramsar Convention).

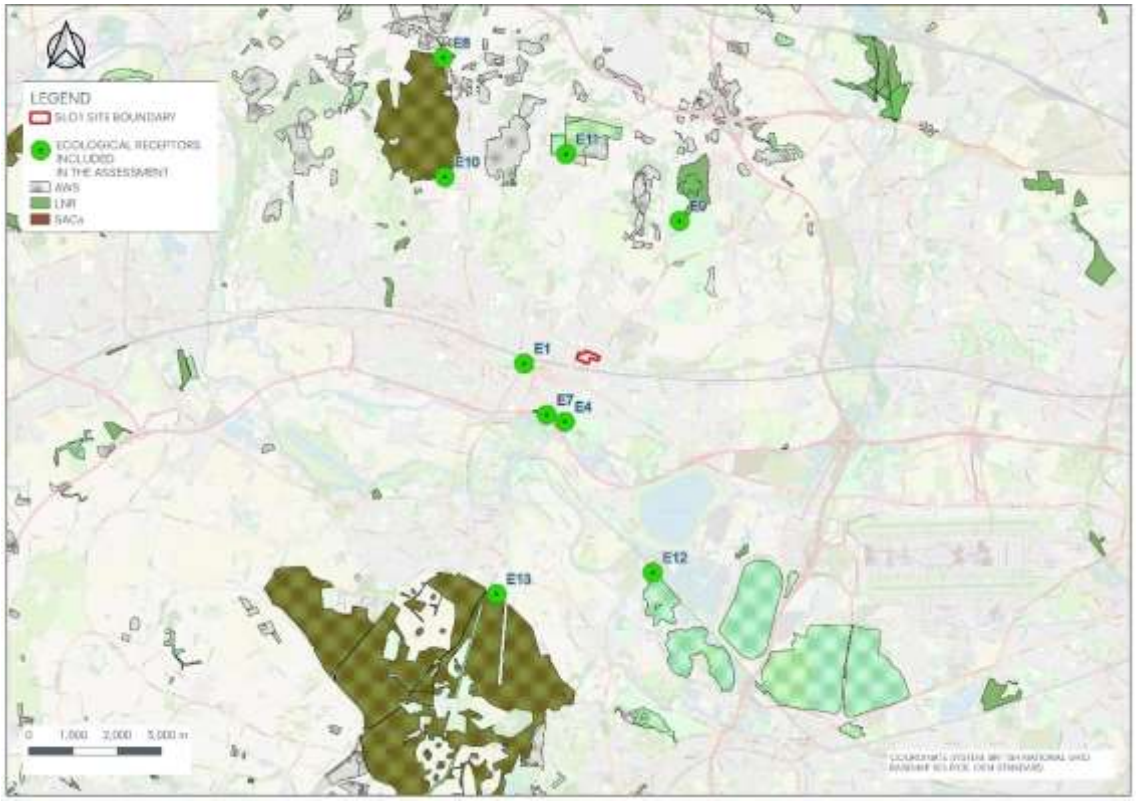
The list of ecological receptors included within the model is presented in Table 4.2 and depicted in Figure 10.

Table 4.2 Ecological Receptor Locations

ID	Receptor	Designation	Sensitivity Rating in relation to NOx *	OS GR X (m)	OS GR Y (m)
E1	Railway Triangle	LWS	Low	497318	180155
E4	Upton Court Park	LWS	Low	498238	178838
E7	Herschel Park	LNR	Medium	497830	178995
E8	Burnham Beeches**	SAC	High	495487	187068
E9	Black Park	SSSI	High	500835	183379
E10	Burnham Beeches**	SAC	High	495524	184373
E11	Stoke Common	SSSI	High	498269	184891
E12	South West London Waterbodies	Ramsar & SPA	High	500230	175425
E13	Windsor Forest & Great Park	SAC	High	496695	174943
*** Sensititivty applied as per EA guidance document "*Air emissions risk assessment for your environmental permit*"**[22] **** Two receptors modelled within Burnham Beeches SAC within north and south extremities.**					

[22] Available at https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#before-you-start-this-risk-assessment

Figure 10: Ecological Receptor Locations



4.3 Atmospheric Dispersion Modelling Methodology

The scope of the impact assessment for stack emissions from the Proposed Development generators has been determined in the following way:

- Review of air quality data for the area surrounding the Site, including data from local authority monitoring from SBC, the Defra Air Quality Information Resource (UK-AIR) and the APIS;
- Desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- Review of emission parameters for the Proposed Development and dispersion modelling using the ADMS 6 modelling software developed by Cambridge Environmental Research Consultant (CERC) to predict ground-level concentrations of pollutants at sensitive human and ecological receptor locations.

4.3.1 Operational Scenarios

A total of four (4) model scenarios have been assessed which represents the proposed layout and design details for Proposed Development during ‘Standalone’ and ‘In-Combination’ operations.

Emission limits supplied by the Mechanical and Electrical (M&E) consultant have been used for the purposes of the modelling assessment and each generator is modelled to be operating at 100% load during all operating scenarios.

The below four scenarios have been modelled.

Most Likely ('Testing') Scenario during Standalone Operations (i.e. Buildings A and B Only)

- Monthly testing for a duration of 15 minutes at 0% load, but modelled at 100% load – totalling to 3 hours/year; and,
- 6 monthly testing for a duration of 6 hours at 100% load, modelled at 100% load – totalling to 12 hours/year;

Worst Case ('Emergency') Scenario during Standalone Operations (i.e. Buildings A and B Only)

- Monthly testing for a duration of 15 minutes at 0% load, but modelled at 100% load – totalling to 3 hours/year; and,
- 6 monthly testing for a duration of 6 hours at 100% load, modelled at 100% load – totalling to 12 hours/year; and,
- Emergency operation for a maximum duration of 92 hours/year at 100% load.

Most Likely ('Testing') Scenario during In-Combination Operations (i.e. Buildings A, B and Future Phase Building C)

- Monthly testing for a duration of 15 minutes at 0% load, but modelled at 100% load – totalling to 3 hours/year; and,
- 6 monthly testing for a duration of 6 hours at 100% load, modelled at 100% load – totalling to 12 hours/year;

Worst Case ('Emergency') Scenario during In-Combination Operations (i.e. Buildings A, B and Future Phase Building C)

- Monthly testing for a duration of 15 minutes at 0% load, but modelled at 100% load – totalling to 3 hours/year; and,
- 6 monthly testing for a duration of 6 hours at 100% load, modelled at 100% load – totalling to 12 hours/year; and,
- Emergency operation for a maximum duration of 92 hours/year at 100% load.

4.3.2 Engine Parameters

The facility will use diesel-fuelled spark ignition engines for the generation of electricity.

The input parameters used in this assessment were based on generators designed by the M&E Consultant for the project. The modelled emission parameters for Buildings A and B generators are shown in Table 4.3 below.

Design details for Building C are based on current draft plans. It should be noted that a separate permit variation application would be submitted for this future development phase and the revised design details would be included, as appropriate. The modelled emission parameters for Buildings C are shown in Table 4.4.

The locations of all generator stacks (Buildings A, B and C) are shown in Figure 10, below.

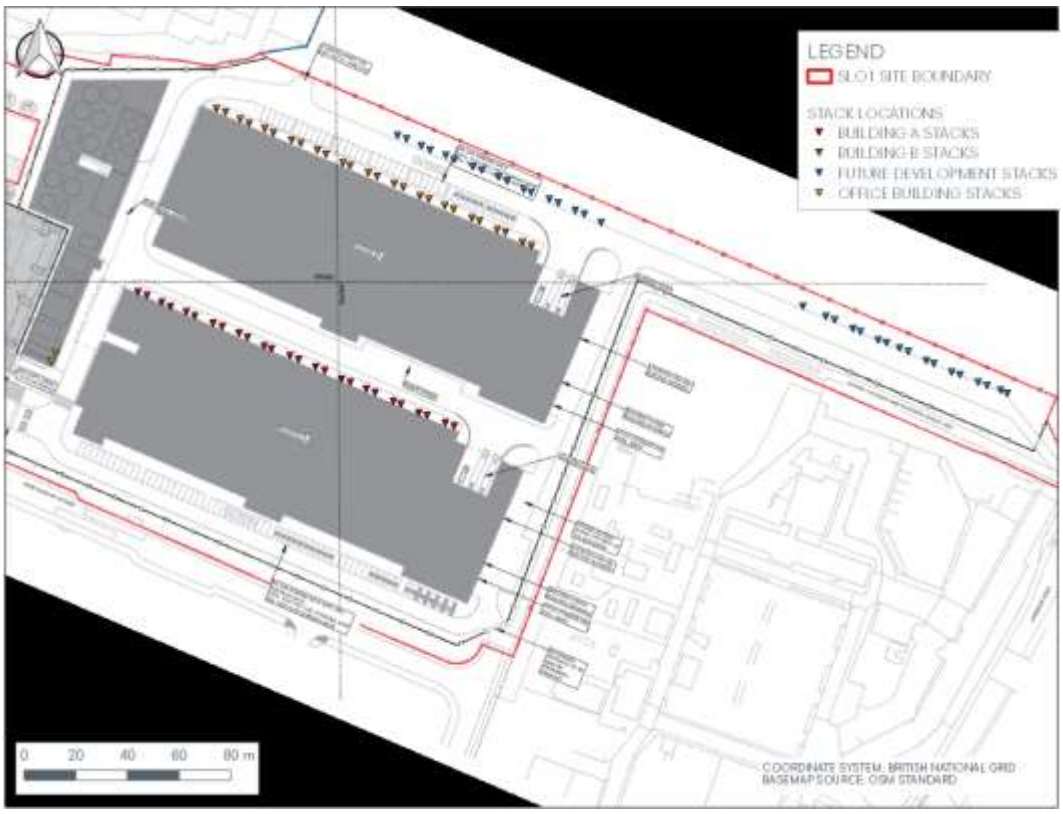
Table 4.3 Modelled Emissions Parameters (Buildings A and B)

Parameter (per engine)	Building A	Building B
Number of Units	26	26
Generator Power, at 100% load (KWe)	2,400	2,400
Stack Height, above ground level (m)	21.95	21.95
Temperature of Release (K)	789.15	789.15
Emission Velocity at Stack Exit (m/s)	45.3	45.3
Actual Flow Rate per combined stack (Am^3/s)	10.3	10.3
Normalised Flow Rate per combined stack (Nm^3/s)*	1.11	1.11
NOx Emission Concentration (mg/Nm^3)*	1,998	1,998
NOx Emission Concentration (g/s)	2.22	2.22
O_2 Content (%)	9.4	9.4
Water Content (%)	4.8	4.8
* **Normalised at 273K, 101.3 kPa, dry, 5% O_2**		

Table 4.4 Release Parameters (Building C)

Parameter (per engine)	Building C
Number of Units	34
Generator Power, at 100% load (KWe)	2,200
Stack Height, above ground level (m)	17
Temperature of Release (K)	750.8
Emission Velocity at Stack Exit (m/s)	41.1
Actual Flow Rate per combined stack (Am^3/s)	8.07
Normalised Flow Rate per combined stack (Nm^3/s)*	0.87
NOx Emission Concentration (mg/Nm^3)*	2,575.8
NOx Emission Concentration (g/s)	2.25
O_2 Content (%)	10.1
Water Content (%)	9.1
* **Normalised at 273K, 101.3 kPa, dry, 5% O_2**	

Figure 10: Location of generator stacks



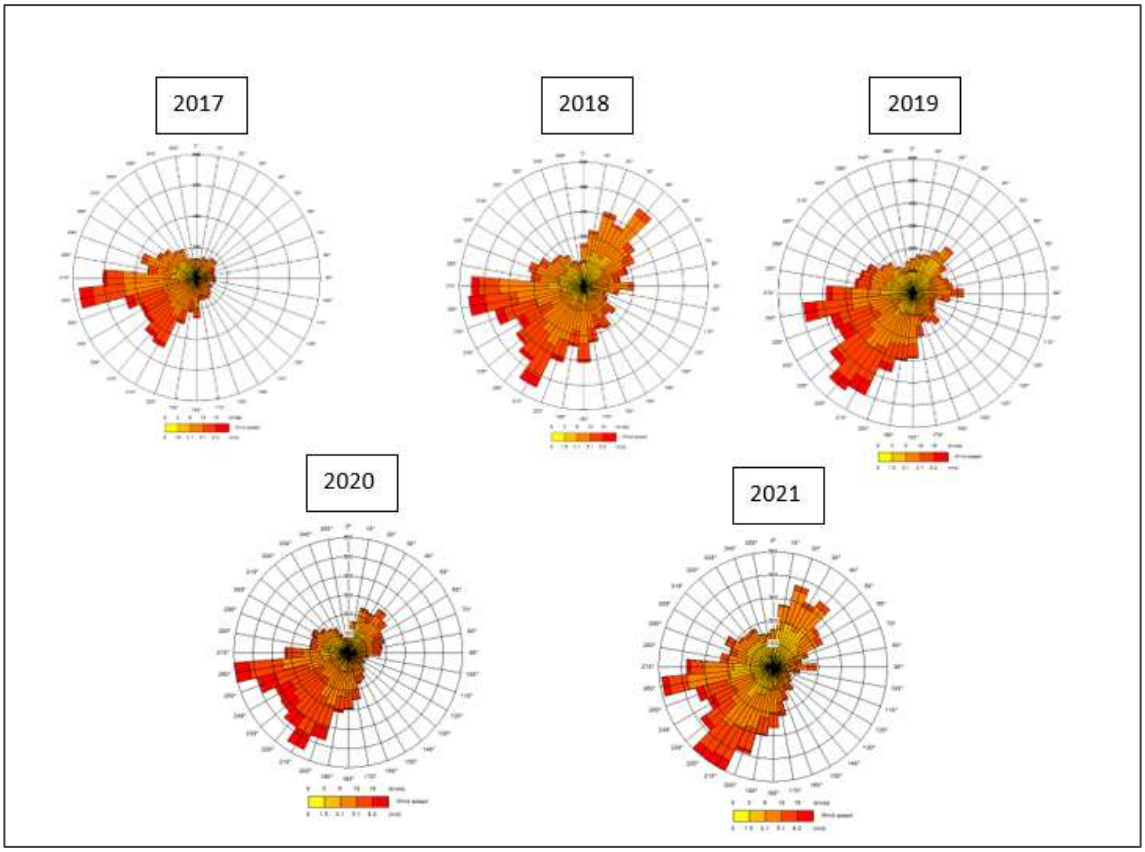
4.3.3 Local Meteorological Data

The dispersion modelling has been based on five years (2017-2021) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions.

Data from the meteorological station at Heathrow Airport has been used for the assessment, which is the most representative data currently available for the study area.

A wind rose for all years of meteorological data is presented in Figure 11.

Figure 11: Wind Rose data from Heathrow Airport Met Station (2017-2021)



4.3.4 Surface Roughness and Terrain

The surface roughness of the dispersion site and meteorological site was set to 0.5 m to represent open suburbia conditions. The Minimum Monin-Obukhov length (MMOL) of the dispersion site and meteorological site was set to 15 m to represent low density mixed urban/industrial conditions.

The complex terrain module within ADMS was used to apply OS Landford Panorama terrain data at 50 m x 50 m resolution for the modelled study area, capturing all modelled receptors.

4.3.5 Building Downwash/Entrainment

The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to downwash. ADMS 6 accounts for the effects of building downwash, which is due the enhanced turbulent mixing of pollutants in the lee of buildings which can result in high pollutant concentrations in the wake of the building

All proposed buildings, including future phase indicative building layout (Building C; In-Combination modelling only) have been included in the dispersion model to account

for potential downwash effects. Details of all buildings included in the model are shown in Table 4.5 below and are presented in **Figure 12**

Table 4.5 Building Dimensions within the Site used in the Dispersion Model

Building	Approximate Centre Point		Height (m)	Length (m)	Width (m)	Angle (°)
	(X)	(Y)				
Building A	498671.4	180239.8	19.95	45.19	136.27	136.27
Building B	498698.9	180310.7	19.95	37.99	141.77	20.9
Building C1	498777.3	180377.0	15	39.2	125.37	201.49
Building C2	498934.9	180310.4	15	39.2	141.77	201.49

Figure 12 All buildings Included in modelling

4.4 Results Processing

4.4.1 Atmospheric Chemistry

Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO). Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on several factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3).

With respect to NO_X emissions released by the Proposed Development generators, the EA's Air Quality Modelling and Assessment Unit (AQMAU) guidance[23] on the conversion ratio for NO_X to NO_2 has been followed. This assumes a worst-case conversion ratio of 70% of NO_X as NO_2 in relation to long term (annual mean) impacts and 35% of NO_X as NO_2 in relation to short-term (1-hour mean) impacts.

4.4.2 Statistical Analysis of Short-Term Impacts

The approach to assessment of short-term impacts adopted is consistent with AQMAUs approach defined in the Guidance on dispersion modelling for oxides of nitrogen assessment from generators[24]. The approach requires modelling the impact of the generator plant for 8,760 hours of the year to ensure that the operating hours coincide with the worst-case dispersal conditions.

To determine the probability of an exceedance of the hourly mean NO_2 objective for a short-term infrequent operation, the cumulative hypergeometric distribution has been used (with the 2.5 factor applied for consecutive operating hours) to assess the likelihood of exceedance hours coinciding with the operational hours. The EA guidance provides the following framework to apply to the calculated probability:

- probabilities of 1% or less indicate exceedances are highly unlikely;
- probabilities of less than 5% indicate exceedances are unlikely; and
- probabilities of 5% or more indicate there is potential for the exceedances and may not be considered acceptable on a case-by-case basis.

4.4.3 Nitrogen Deposition and Acid Deposition Rates

4.4.3.1 Calculation of Contribution to Critical Loads

Deposition rates for nutrient nitrogen deposition and acid deposition were calculated based on EA guidance document AQTAG06[25]. The dry deposition fluxes for NO_2 and SO_2 were calculated using the following equation:

> Dry deposition flux ($\mu g/m^2/s$) = ground level concentration ($\mu g/m^3$) x deposition velocity (m/s)

The applied deposition velocities for the relevant chemical species are as shown in Table 4.6.

23 Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NOX and NO2' (no date).

24 Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

25 AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

Table 4.6 Deposition Velocities

Species	Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.003
SO_2	Grassland	0.012
	Woodland	0.024

The predicted deposition fluxes were converted from µg/m^2/s to units of nitrogen deposition and acid (N+S) deposition rates by multiplying the dry deposition flux by the factors detailed in Table 4.7.

Table 4.7 Applied Deposition Conversion Factors

Deposition as µg/m^2/s of species	Conversion to:	Using Factor:
NO_2	kgN/ha/year (N-deposition)	95.9
	keq/ha/year (Acid deposition)	6.84
SO_2	keq/ha/year (Acid deposition)	9.84

4.4.4 Addition of Background Concentrations / Desposition Rates

Total NO_x, NO_2 and nitrogen / acid deposition (Predicted Environmental Concentrations (PECs)) were calculated from the relevant Process Contributions (PCs) as follows:

- PEC = PC + Background Concentration[26]

The PECs were then compared with the relevant assessment levels provided in Section 3.1.5. At the ecological receptors, the NO_2 and SO_2 PCs were converted to nitrogen and acid deposition rates, with total deposition rates (PEC) derived by adding the site-specific background deposition rate, given by APIS.

In the calculation of the likelihood of exceedance of a short-term standard (sub-daily), the background concentration was assumed to be double the respective annual mean background as per EA guidance.

[26] For annual mean NO_2 concentrations, a modelled baseline concentration (without generators) was used as the background value to provide a conservative assessment, based on results of the Environment Statement (Chapter 12 (document ref - A114100, dated December 2019) ('AQ ES Chapter') submitted to Slough Borough Council with planning ref - P/00072/096. The highest modelled annual mean value from all modelled receptors within proximity to the Site was used (39.2 µg/m^3). See Section 5 of this report for more details.

Therefore, the exceedance threshold was set to:

- Exceedance Threshold (NO_2) = AQ Standard – 2 x Annual Mean Background[26]

4.5 Significance of Impact

4.5.1 Assessment of Impact and Significance (Human Receptors)
In accordance with the EA's guidance, the impact is insignificant or negligible if the long-term process contribution is <1% of the long-term assessment level.

For process contributions that cannot be considered insignificant, further assessment has been undertaken and the Predicted Environmental Concentration (PEC: Process Contribution + existing background pollutant concentration) determined for comparison as a percentage of the relevant air quality objective.

The EA's guidance indicates that no further assessment is required if the resulting PEC is below the air quality objective and the applied emission levels comply with the BAT requirements.

The assessment of impacts against the air quality objectives as defined in Section 3.1.5 was undertaken using the model outputs as described in Table 4.8 below.

Table 4.8 Summary of Assessment of Model Outputs

Air Quality Objective / Critical Level	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
NO_2 1 Hour Mean. Not to be exceeded more than 18 times a calendar year	Threshold violation file counts number of hours per annum exceeding threshold (threshold set at 200µg/m^3 minus 2 x annual mean background#, converted to NO_X assuming 35% of NO_X present as NO_2)	Probability of exceedance calculated using hypergeometric distribution
NO_2 Annual Mean	Annual mean from 5 met. years (factored for operational hours) PC factored for 70% of NO_X present as NO_2	PC + Baseline*
PM_{10} Annual Mean	Annual mean from 5 met. years (factored for operational hours) PC factored	PC + Baseline*
CO 8 Hours Running Mean	Threshold set to 100th percentile of 1-hour concenrations. Used conversation factor (of 0.7) for 1hour -> 8hours	PC + 2x Defra background

Air Quality Objective / Critical Level	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
SO_2 – 15 Mins	Threshold set to 100th percentile of 1-hour concenrations. Used conversation factor for 1hour -> 15-mins	PC + 2x Defra background
	Threshold set to 100th percentile of 1-hour concenrations.	PC + 2x Defra background
	Threshold set to 100th percentile of 1-hour concenrations. Used conversation factor for 1hour -> 24 hours	PC + 2x Defra background
Notes: * PEC includes contribution from vehicle movements associated with Proposed Development operation phase. See Environment Statement (Chapter 12 (document ref - A114100, dated December 2019) ('AQ ES Chapter') submitted to Slough Borough Council with planning ref - *P/00072/096*). See Section 5. # The highest modelled annual mean value from all modelled receptors within proximity to the Site was used (39.2 µg/m^3), see Section 5.		

4.5.2 Assessment of Impact and Significance (Ecological Receptors)

In addition to the EA guidance, the EA's Operational Instruction 66_12[27] details how the air quality impacts on ecological sites should be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, 'no likely damage' for SSSI's and 'no significant pollution' for other sites, as follows:

- PC is <1% long-term critical level and/or critical load or that the PEC is <70% long-term critical level and/or critical load for European sites and SSSIs.
- PC <10% short-term critical level for NO_X (if applicable) for European sites and SSSIs.
- PC <100% long-term critical level and/or critical load for other conservation sites.
- PC <100% short-term critical level for NO_X (if applicable) for other conservation sites.

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with EAs Operational Instruction 67_12. This can require the

27 NRW/EA Working Instruction 66_12 – Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for ¡mpacts on nature conservation

consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors such as the water table.

4.5.2.1 Calculation of PC as a percentage of Acid Critical Load Function

The process contribution of nitrogen (N) and sulphur (S) was calculated as a proportion of the acid critical load (CL) function according to the guidance from APIS, which is as follows:

"The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying affects of sulphur from the process need to be considered:

Where PEC N Deposition < CLminN;

*PC as % CL function = (PC S deposition/CLmaxS)*100*

Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.

Where PEC N Deposition > CLminN;

*PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100"*

5 Baseline Conditions

5.1 SBC Air Quality Review

Air quality data as gathered by Slough Borough Council as part of its Local Air Quality Management (LAQM) duties is summarised below. Table 5.1 shows the data from the monitoring stations within 1km of the Proposed Development extracted from SBC's Air Quality Progress Report for 2020[28] (latest available published report).

Table 5.1 Annual Mean NO2 from SBC

Location ID	Distance from the Proposed Development (0.5kms)	Annual Mean Background Concentrations (µg/m^3)				
		2015	2016	2017	2018	2019
SLO44	0.13	38.7	38.4	36.4	31.9	29.8
SLO27	0.19	31.4	33.9	31.3	26.9	26.5
SLO5	0.39	**40.3**	**40.8**	**40.7**	34.4	33.6
SLO40	0.43	**42.1**	**44.8**	**42.3**	38.6	37.9
SLO33	0.49	**-**	**-**	**48.7**	**40.0**	39.5

The above data shows that the annual mean NO_2 concentrations were below the objective in 2019.

5.2 Modelled Baseline Concentrations for Human Receptors (Annual Mean NO_2 & PM_{10})

To provide a conservative assessment of PEC, the baseline annual mean NO_2 and PM_{10} data from the traffic modelling assessment, completed as part of the Environmental Statement air quality assessment (AQ ES Chapter)[29], has been adopted as the baseline data.

The emissions contributions from the data centre generators (PC) modelled in this study will be combined with the modelled concentrations taken from the AQ ES Chapter, inclusive of Defra background, baseline traffic emissions, in addition to traffic contributions associated with the proposed development included in the planning application[29], thus representing a conservative PEC.

The annual mean NO_2 and PM_{10} concentrations used as baseline in this study are presented in Table 5.2.

[28] Available at https://www.slough.gov.uk/downloads/file/160/asr-2020

[29] Environment Statement (Chapter 12 (document ref - A114100, dated December 2019) ('AQ ES Chapter') submitted to Slough Borough Council with planning ref - P/00072/096.

Table 5.2 Annual mean baseline NO_2 concentrations adopted for this study[26]

Receptor ID	Receptor Location	Baseline Annual Mean for this Study (µg/m³) *	
		NO_2	PM_{10}
R1	Princes Street	35.66	19.24
R2	Hazelmere Road	25.83	17.03
R3	Yew Tree Road	34.09	18.86
R4	Wexham Road	33.40	18.85
R5	Apsley House	30.98	18.13
R6	Cornwall House	32.82	19.44
R7	Claycoats School	29.62	17.89
R8	Windmill Care Centre	32.46	18.66
R9	Tuns Lane	32.04	19.14
R10	Paxton Avenue	39.24	20.28
R11	Spackmans Way	38.47	20.01
R12	Slough and Eton CoE Business and Enterprise College	31.26	18.45
R13	Windsor Road	32.98	19.24
R14	Saint Mary's Church of England Primary School	26.69	17.17
R15	16 John Taylor Court	34.71	18.97
R16	19 Farnham Road	28.92	17.72
R17	49 Stoke Road	30.02	17.85
R18	50 Stoke Road	28.96	17.62
R19	100 Wexham Road	33.65	19.19
R20	98 Broadmark Road	27.99	17.48
R21	25 Cannon Gate	25.18	16.94
R22	27 Clifton Road	30.45	18.15
R23	Slough AQMA**	35.66	18.96
R24	South Bucks AQMA**	32.84	18.96
PR1	New Residential Development (South of the Site)^	32.83	18.96
PR2		32.83	18.96
PR3		32.83	18.96
PR4		32.83	18.96
PR5		32.83	18.96
PR6		32.83	18.96

Receptor ID	Receptor Location	Baseline Annual Mean for this Study (µg/m^3) *	
		NO_2	PM_{10}
PR7		32.83	18.96
PR8		32.83	18.96
PR9		32.83	18.96
PR10		32.83	18.96

*** Verified air quality model concentrations, including background and contribution from vehicle movements associated with Proposed Development operation phase in opening year (2026). See Environment Statement (Chapter 12 (document ref - A114100, dated December 2019) ('AQ ES Chapter') submitted to Slough Borough Council with planning ref - P/00072/096).**

**** Data from R1 used as being representative due to proximity.**

^ Data from PR2 used as representative of all PRx receptors (within same development site).

5.3 Background Pollutant Concentrations for CO and SO_2

Additional information on estimated background pollutant concentrations has been obtained from the DEFRA background maps provided on UK-AIR, the Air Quality Information Resource[30]. These maps are available in 1km x 1km grid squares and provide an estimate of concentrations. Concentrations have been taken from the grid square 538500; 180500; which includes the Site. Estimated air pollution concentrations for CO and SO_2 have been extracted from the 2001 background pollution maps and are set out in Table 5.3 below.

All the annual mean background concentrations are below the respective air quality objectives.

Table 5.3 Annual Mean Background Concentrations for Pollutants CO and SO_2 from Defra Background Maps

Pollutant	Annual Mean Background Concentration (µg/m^3)
CO	971.2 (adjusted to 2026)
SO_2	4.05 (2001 data)

5.4 Baseline Pollutant Concentration and Deposition Rates for Ecology Receptors

The background concentrations for NO_x and background nitrogen and acid annual deposition rates, including site-specific critical loads, at the relevant ecological sites are presented in Table 5.4 below.

[30] Available at http://uk-air.defra.gov.uk

Table 5.4 Baseline Pollutant Concentration and Deposition Rates for Ecology Receptors

ID	Name	Background Annual Mean NO_x ($\mu g/m^3$)*	Background Nitrogen Deposition (kgN/ha/yr)*	Critical Load (kgN/ha/yr)	Background Acid Deposition (keq/ha/yr)*	Critical Load (CLminN; keq/ha/yr)
E1	Railway Triangle LWS^	27.8	24.6	10	1.9	0.142
E4	Upton Court Park LWS^	25.5	23.3	10	1.8	0.142
E7	Herschel Park LNR^	28.9	23.2	10	1.8	0.142
E8	Burnham Beeches SAC^	15.9	24.6	10	1.9	0.142
E9	Black Park SSSI#	18.9	15.1	5	1.2	1.594
E10	Burnham Beeches SAC^	16.7	24.7	10	1.9	0.142
E11	Stoke Common SSSI#	17.9	13.8	5	1.1	0.714
E12	South West London Waterbodies SPA^	18.8	24	10	1.9	0.142
E13	Windsor Forest & Great Park SAC^	18.3	23.1	10	1.8	0.142

Note:

*** Year 2020 (Source: https://www.apis.ac.uk/app; accessed 14 June 2023); 1km² average (NOx), 5km² average (N-dep & Acid Dep)**

^ Background N-deposition and acid deposition based on deposition to woodland / forest. Receptors E1, E2, E3, and E12 assumed to have same critical loads as Burnham Beeches SAC in the absence of site-specific critical load data.

 # Background N-deposition and acid deposition based on deposition to grassland.

6 Assessment of Impacts

The results presented for each pollutant and scenarios represent the maximum modelled impacts from the five years (2017 to 2021) of meteorological data modelled.

The model results have been summarised within the following sections and the maximum impacts and headlines have been reported. The full results from the dispersion modelling assessment are presented within **Appendix A**.

6.1 Impact on NO_2 Concentrations at Discrete Human Receptors

6.1.1 'Most Likely' Operation (Testing)

A summary of the impacts predicted during the routine testing and maintenance undertaken at the Site ('Most Likely Operation') on NO_2 is presented in Table 6.1 for both the 'standalone' and 'in-combination' operating scenarios.

To account for the proposed testing, the results have been factored for 15 hours of operation per year (15/8,760) which represents the proposed testing and maintenance schedule.

The PC at all receptors is below 1% of annual mean objective and the PECs do not exceed the annual mean national air quality objective of 40µg/m^3.

For the 1-hour mean, statistical analysis using hypergeometric distribution was undertaken for the 15 hours of testing and maintenance operations. For the 'Standalone' and 'In-Combination' scenarios, the probability of exceeding the NO_2 1-hour mean air quality objective is less than 0.01% at all modelled receptors.

Table 6.1 Results of Routine Testing and Maintenance at Human Receptors (NO_2)

Scenario	NO_2 Annual Mean (factored for 15 hours/annum)	NO_2 1-hour Mean – Hypergeometric Distribution to assess probability of exceedance
Standalone	Maximum PC: 0.28µg/m^3 (0.7% of the annual mean objective) Maximum PEC: 39.2µg/m^3 No. receptors exceeding objective: 0	Probability of exceedance: 0%
In-combination	Maximum PC: 0.71µg/m^3 (1.78% of the annual mean objective) Maximum PEC: 39.2µg/m^3 No. receptors exceeding Objective: 0	Probability of exceedance: 0%

6.1.2 'Worst Case' Operation (Emergency Operations)

A summary of the impacts predicted during unplanned emergency operation, where the generators operate to provide electricity to the Site for up to 92 hours, is presented in Table 6.2, for both the 'standalone' and 'in-combination' operating scenarios. The analysis has included the hours of operation applicable to testing and maintenance (i.e. 92 hours + 15 hours = 107 hours).

In both the 'Standalone' and 'In-combination' scenarios, the maximum PC is above 1%. However, PECs do not exceed the annual mean national air quality objective of 40µg/m^3 in either operating scenario.

For the 1-hour mean, statistical analysis using hypergeometric distribution was undertaken for the total 107 hours of operations. For the 'Standalone' and 'In-Combination' scenarios, the probability of exceeding the NO_2 1-hour mean air quality objective is less than 0.01% at all modelled receptors.

In this worst-case operating scenario, the annual mean impacts are dominated by the theoretical emergency operations, with impacts from the testing operations representing <0.3 µg/m^3 at all modelled receptors. Furthermore, the emergency operations are considered highly unlikely to occur, especially in consecutive years and thus the impacts presented in Table 6.2 are conservative.

Table 6.2 Results of Emergency Operations at Human Receptors (NO_2)

Scenario	NO_2 Annual Mean (factored for 107 hours/annum)	NO_2 1-hour Mean – Hypergeometric Distribution to assess probability of exceedance
Standalone	Maximum PC: 2.01µg/m^3 (5.02% of the annual mean objective) Maximum PEC: 39.3µg/m^3 No. of exceeding receptors: 0	Probability of exceedance: 0%
In-combination	Maximum PC: 5.08µg/m^3 (12.70% of the annual mean objective) Maximum PEC: 39.3µg/m^3 No. of exceeding receptors: 0	Probability of exceedance: 0%

6.2 Impact on Other Pollutant Concentrations at Discrete Human Receptors

6.2.1 'Most Likely' Operation (Testing)

A summary of the modelled impacts during the 'Most Likely Scenario' on PM_{10}, SO_2 and CO are presented in Table 6.3.

The results demonstrate that the PC at all receptors is modelled to be below 1% of respective air quality objectives, with the exception of 24-hour mean SO_2 concentrations, where marginal exceedances of the 1% criterion are predicted. However, all PECs do not exceed the relevant objectives.

6.2.2 'Worst Case' Operation (Emergency Operations)

A summary of the modelled impacts during emergency operations at the Site ('Worst Case Scenario') on PM_{10}, SO_2 and CO are presented in Table 6.4.

The results demonstrate that the PC at all receptors is below 1% of the respective objectives with the exception of 24-hour mean SO_2 concentrations, where marginal exceedances of the 1% criterion are predicted. However, all PECs do not exceed the relevant objectives.

Table 6.3 Results of Testing Operations for Human Receptors (PM_{10}, SO_2 and CO)

Scenario	PM_{10} Annual Mean (factored for 15 hours)	SO_2 15-mins – 100th percentile	SO_2 1-hour Mean – 100th percentile	SO_2 24-hours Mean – – 100th percentile	CO 8-hours Mean – 100th percentile
Standalone	Maximum PC: <0.01µg/m³ (<0.01% of the objective) Maximum PEC: 20.3µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 1.42µg/m³ (0.5% of the objective) Maximum PEC: 9.5µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 1.39µg/m³ (0.4% of the objective) Maximum PEC: 9.5µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 1.39µg/m³ (**1.1**% of the objective) Maximum PEC: 9.5µg/m³ No. of receptors exceeding objective: 0	Maximum PC: <0.05µg/m³ (<0.01% of the objective) Maximum PEC: 971.2µg/m³ No. of receptors exceeding objective: 0
In-combination	Maximum PC: <0.01µg/m³ (<0.01% of the objective) Maximum PEC: 20.3µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 1.75µg/m³ (0.66% of the objective) Maximum PEC: 9.9µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 1.72µg/m³ (0.5% of the objective) Maximum PEC: 9.8µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 1.72µg/m³ (**1.4**% of the objective) Maximum PEC: 9.8µg/m³ No. of receptors exceeding objective: 0	Maximum PC: 0.08µg/m³ (<0.01% of the objective) Maximum PEC: 971.3µg/m³ No. of receptors exceeding objective: 0

Table 6.4 Results of Emergency Operations for Human Receptors (PM_{10}, SO_2 and CO)

Scenario	PM_{10} Annual Mean (factored for 15 hours)	SO_2 15-mins – 100th percentile	SO_2 1-hour Mean – 100th percentile	SO_2 24-hours Mean – 100th percentile	CO 8-hours Mean – 100th percentile
Standalone	Maximum PC: 0.01µg/m^3 (<0.03% of the objective) Maximum PEC: 20.3µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 1.42µg/m^3 (0.5% of the objective) Maximum PEC: 9.5µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 1.39µg/m^3 (0.4% of the objective) Maximum PEC: 9.5µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 1.39µg/m^3 (**1.1**% of the objective) Maximum PEC: 9.5µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: <0.05µg/m^3 (<0.01% of the objective) Maximum PEC: 971.2µg/m^3 No. of receptors exceeding objective: 0
In-combination	Maximum PC: 0.03µg/m^3 (0.06% of the objective) Maximum PEC: 20.3µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 1.75µg/m^3 (0.66% of the objective) Maximum PEC: 9.9µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 1.72µg/m^3 (0.5% of the objective) Maximum PEC: 9.8µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 1.72µg/m^3 (**1.4**% of the objective) Maximum PEC: 9.8µg/m^3 No. of receptors exceeding objective: 0	Maximum PC: 33.96µg/m^3 (0.3% of the objective) Maximum PEC: 1005.2µg/m^3 No. of receptors exceeding objective: 0

6.3 Discrete Ecological Receptors

The results of the air quality modelling at the identified sensitive ecological receptors, as presented in Table 4.4, are summarised below for each operational scenario.

6.3.1 'Most Likely' Operation (Testing)

The results of the dispersion modelling show that there is a negligible impact on annual mean NO_x concentrations, nitrogen deposition, and acid deposition during Testing operations, applicable to both the standalone and in-combination scenarios. Therefore, the focus of the assessment on annual mean concentrations and deposition rates is on the outputs of the Emergency operations scenarios.

As testing is undertaken for a duration significantly lower than the daily averaging period, the impacts associated with the 15-hour routine testing and maintenance schedule on Daily Mean NO_x concentrations for both the standalone and in-combination scenarios is considered to be Insignificant.

6.3.2 'Worst-Case' Scenario (Emergency)

The impacts associated with Emergency operation are summarised in Table 6.5 for daily mean and annual mean NO_x concentrations, applicable to both the standalone and in-combination scenarios.

The impacts relating to N-deposition and acid deposition are presented in Tables 6.6 for the standalone scenario and Table 6.7 for the in-combination scenario.

As per Section 6.1.2, the emergency operations are considered highly unlikely to occur, especially in consecutive years and thus the impacts presented in this section are conservative.

The annual mean NO_x results demonstrate that impacts remain below 1% of the critical level at all relevant European Sites, in both the standalone and in-combination scenarios. For local sites, the maximum PC is predicted at Herschel Park LNR (1.1% of the critical level), substantially below the 100% of critical level threshold.

The daily mean NO_x concentrations exceeded the 1% of the daily critical level at all receptors during the 'Standalone' and 'In-Combination' scenarios. However, none of the receptors are predicted to exceed the PEC of the daily critical level of 200µg/m^3. During the 'Standalone' scenario, the highest PC of 57.5% was predicted at Upton Court Park LWS. The highest PC at high sensitive ecological receptor was predicted at Black Park SSSI at 14.1% f the daily critical level. During the 'In-Combination' scenario, the highest PC of 93.8% was predicted at Upton Court Park LWS. The highest PC at high sensitive ecological receptor was predicted at Black Park SSSI at 23.1% of the daily critical level. All PECs at high sensitive ecological receptors were well below 70% of the daily critical level in both scenarios.

The annual N-deposition and acid deposition impacts for 'Worst-Case' operation in the 'standalone' scenario (Table 6.6) and 'in-combination' scenario (Table 6.7) are modelled to be negligible at all receptors.

Table 6.5 Annual Mean NO_x impacts during Worst Case Scenario (Emergency) on Ecological Receptors

Scenario	Annual Mean NO_X (factored for 105 hours)	Comments
Standalone	**European Sites -** PC is <1% of the annual mean NO_X critical level and is therefore insignificant	Annual mean NO_X impacts are insignificant.
	Local Sites - PC is <1% of the annual mean NO_X critical level and is therefore insignificant Maximum annual mean NO_X PC: 0.18µg/m^3 (0.6% of critical level)	Annual mean NO_X impacts are <100% of the PC for all critical level and therefore insignificant.
In-Combination	**European Sites -** PC is <1% of the annual mean NO_X critical level and is therefore insignificant	Annual mean NO_X impacts are insignificant.
	Local Sites - PC is <1% of the annual mean NO_X critical level and is therefore insignificant Maximum annual mean NO_X PC: 0.3µg/m^3 (1.1% of critical level)	Annual mean NO_X impacts are insignificant.

Table 6.6 Modelled Annual Mean Nitrogen & Acid Deposition Impacts ('Worst-Case' Operation; Standalone Scenario)

ID	Annual N-Deposition (kgN/ha/yr)	N-deposition as % of Critical Load	Annual Acid Deposition (keqN/ha/yr)	Acid Deposition as % of Critical Load	Insignificant impact? (Y/N)
E1	0.02	0.2%	0.002	0.1%	Yes
E4	0.03	0.3%	0.002	0.1%	Yes
E7	0.04	0.4%	0.003	0.1%	Yes
E8	0.00	0.0%	0.000	<0.1%	Yes
E9	0.01	0.1%	0.000	<0.1%	Yes
E10	0.00	0.0%	0.000	<0.1%	Yes
E11	0.00	0.1%	0.000	<0.1%	Yes
E12	0.00	0.0%	0.000	<0.1%	Yes
E13	0.01	0.1%	0.001	<0.1%	Yes

Table 6.7 Modelled Annual Mean Nitrogen & Acid Deposition Impacts ('Worst-Case' Operation; In-Combination Scenario)

ID	Annual N-Deposition (kgN/ha/yr)	N-deposition as % of Critical Load	Annual Acid Deposition (keqN/ha/yr)	Acid Deposition as % of Critical Load	Insignificant impact? (Y/N)
E1	0.04	0.4%	0.003	0.2%	Yes
E4	0.06	0.6%	0.004	0.2%	Yes
E7	0.06	0.6%	0.005	0.2%	Yes
E8	0.00	0.0%	0.000	<0.1%	Yes
E9	0.01	0.2%	0.001	<0.1%	Yes
E10	0.01	0.1%	0.000	<0.1%	Yes
E11	0.01	0.1%	0.000	<0.1%	Yes
E12	0.00	0.0%	0.000	<0.1%	Yes
E13	0.01	0.1%	0.001	<0.1%	Yes

6.4 Modelled Gridded Receptors (NO_2 Annual Mean)

The gridded model results for 'Most-Likely' scenario during the 'Standalone' and 'Cumulative' operations are presented in Figures 13 and 14.

The gridded model results for 'Worst-Case' scenario during the 'Standalone' and 'Cumulative' operations are presented in Figures 15 and 16.

Figure 13 – Pollution Contour of NO_2 Annual Mean Concentrations during Most-Likely – Standalone Scenario

Figure 14 – Pollution Contour of NO_2 Annual Mean Concentrations during Most-Likely – Cumulative Scenario

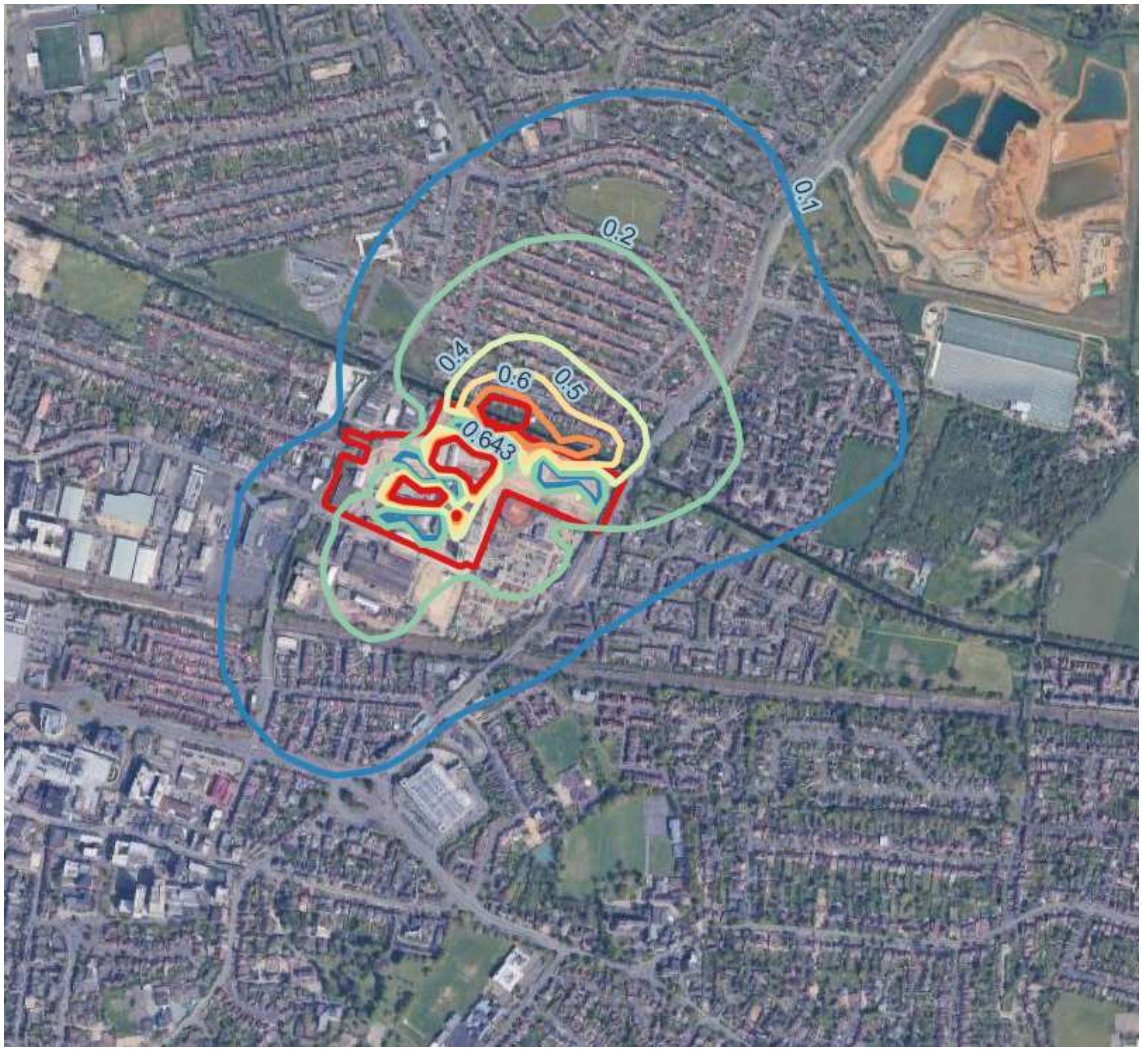


Figure 15 – Pollution Contour of NO_2 Annual Mean Concentrations during Worst Case – Standalone Scenario

Figure 16 – Pollution Contour of NO_2 Annual Mean Concentrations during Worst Case – Cumulative Scenario

7 Summary and Conclusions

An assessment has been carried out to determine the local air quality impacts associated with the operation of back-up generators within the Proposed Development under two operating scenarios – 'Most-Likely' (Typical) and 'Worst-Case' (Emergency), as follows:

Testing Scenario:

- Monthly testing for a duration of 15 minutes at 0% load – totalling to 3 hours/year; and,
- 6 monthly testing for a duration of 6 hours – totalling to 12 hours/year at 100% load.

Emergency Scenario:

- All generators operating for a maximum duration of 92 hours/year at 100% load.

The above operating scenarios were completed for the Site configuration subject to this permit application applicable (Buildings A & B only; 'standalone' assessment) and also a 'future development' scenario whereby it is assumed that Building C (not subject to this permit application) will be developed ('in-combination' assessment).

Detailed air quality modelling using the ADMS dispersion model has been undertaken to predict the impacts associated with stack emissions from all proposed generators in each scenario. Manufacturer emission limits have been used for the modelling assessment and the plant is assumed to be operating at full load for up to 107 hours per year (in total) under the 'Worst-Case' scenario.

All long-term impacts at human and ecological receptors are predicted to be negligible under the 'Most-Likely' and 'Worst-Case' scenarios, within both the standalone and in-combination assessments. Therefore, it is considered that the overall air quality impact of the Proposed Development is '***not significant***'.