Environmental Permit Application

Air Emissions Risk Assessment – Avonmouth Data Centre

Avonmouth Data Centre Limited

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Making Sustainability Happen

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1.0 Introduction

SLR Consulting Ltd (SLR) has been instructed by Renewable Connections Developments Limited to prepare a bespoke Environmental Permit (EP) application for the proposed data centre development (the ‘Proposed Development’) at the Former Polymers Recycling Facility, Viridor Avonmouth ERF, Severn Rd, Avonmouth, Pilning, Bristol, BS11 0YL (the ‘Site’).

Electricity for operation of the data centre will be provided from connections to the local electricity transmission network; however, given the nature of data centres and their requirement to always have an available energy supply, the data centre incorporates 32 diesel-fired stand-by generators (SBGs).

The SBGs will provide power to the data centre in the event of an emergency situation such as a brown-out or black-out of the local electricity transmission network where there are fluctuations or loss of the electrical power provided by the network.

The SBGs will be subject to planned maintenance and testing. There are currently no proposals for the elective generation of electricity for commercial export to the electricity grid and the SBGs do not operate in Triad avoidance.

The aggregated total combustion capacity for the Site will be 233.28 MWth (input) based on 32 SBGs each with a thermal rated input of 7.29 MWth and an output of 2.424 MWe.

This report presents the AERA undertaken to support the EP application and is concerned with emissions to air only.

1.1 Scope of Assessment

The scope of the assessment is limited to the point source combustion emissions to air from the SBGs at the Site. The release of nitrogen oxides (NO_x) has been assessed.

The objective of the study is to assess the impact of emissions against the relevant Air Quality Standards for the protection of human health and the relevant Critical Levels and Loads for the protection of designated ecological receptors.

2.0 Legislation and Relevant Guidance

2.1 Environmental Permitting Regulations

The installation will be regulated under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EPR). The EPR implements European Union Directives including 2010/75/EU (the Industrial Emissions Directive, IED). Guidance relating to the EPR and of relevance to this assessment is discussed below.

2.1.1 AERA Guidance

The 'Air emissions risk assessment for your environmental permit'[1] guidance (termed the 'AERA guidance' throughout the remainder of the report) produced by the EA is intended to assist operators in assessing risks to air when applying for a permit under the EPR.

2.1.2 Data Centre Guidance

The EA has released draft guidance for Data Centres[2] which sets out their approach to the permitting and regulatory aspects for Data Centres within the context of the IED and EPR for 1.1A Combustion Activities 'Chapter II' sites aggregated to >50MWth input.

Also of relevance is the EA's 'Guidance on dispersion modelling for oxides of nitrogen assessment from specified generator'[3]. The guidance proposes methods for statistical analysis of impacts from short-term operation (e.g. using hypergeometric probability distribution) and a framework for acceptable probabilities of impact.

2.2 Air Quality Legislation and Guidance

2.2.1 Air Quality Standards Regulations

The Air Quality Standards Regulations 2010[4] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC) and the Fourth Daughter Directive (2004/107/EC) within UK legislation. The AQSR includes Limit Values, Target Values, and Objectives for the protection of human health and the environment.

Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[5] was introduced to mirror revisions to supporting EU legislation.

2.2.2 US AEGLs

Acute Exposure Guideline Levels (AEGLs) represent short-term exposure limits for toxic airborne chemicals and have been established for nitrogen dioxide (NO_2). AEGL values are developed by the National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances, which is a United States (US) federal advisory committee, and they are not a regulatory standard in the UK. The AEGL-1 for NO_2 has been considered where appropriate, based upon the EA's guidance.

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

[2] EA, 'Data Centre FAQ Headline Approach', Data Centre FAQ DRAFT version 21.0 to TechUK for Discussion 15/11/22.

[3] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

[4] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001.

[5] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument No. 1313.

2.2.3 Air Quality Strategy

The Air Quality (England) Regulations 2000 (as amended) provide the statutory basis for the Air Quality Objectives Local Authorities must adhere to. The latest AQS for England was published in 2023[6]. The AQS provides the delivery framework for air quality management across England for local authorities and summarises the air quality standards and objectives operable within England for the protection of public health and the environment. The objectives of relevance to this assessment are provided in Table 2-1.

These AQS objectives apply at locations where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period (referred to as 'relevant exposure'). Table 2-2 provides an indication of those locations. Where any of the prescribed Air Quality Objectives are not likely to be achieved, the local authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality and achieve compliance.

2.2.4 Applied AQALs

The Air Quality Assessment Levels (AQALs) applied in this assessment are provided in Table 2-1.

Table 2-1: Relevant Ambient AQALs

Pollutant	AQAL (µg/m^3)	Averaging Period	Reference
Nitrogen Dioxide (NO_2)	40	Annual mean	Air Quality (England) Regulations 2000
	200	1-hour mean (not to be exceeded on more than 18 occasions per annum)	Air Quality (England) Regulations 2000
	956	10-minute and 1-hour mean	US-EPA AEGL-1
Nitrogen Monoxide (NO)	4,400	1-hour mean	AERA Guidance EAL

Table 2-2: Human Health Relevant Exposure

AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	As above together with kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

[6] Defra, Air Quality Strategy: Framework for Local Authority Delivery, April 2023.

AQAL Averaging Period	AQALs should apply at	AQALs should not apply at
10-minute mean	All locations where members of the public might reasonably be exposed for a period of 10 minutes or longer	-

2.3 Protection of Nature Conservation Sites

Sites of nature conservation importance at an international, national, and local level are provided environmental protection from developments, including from atmospheric emissions. Standards for the protection of ecological receptors are known as Critical Levels (CLe) (for airborne concentrations) and Critical Loads (CLo) (for deposition rates).

The AERA guidance requires that ecological habitats should be assessed against relevant standards if they are located within the following set distances from the Site:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites within 10km of the Site; and
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNR), Local Nature Reserves (LNR), Local Wildlife Sites (LWS) Ancient Woodland (AW) and Sites of Nature Conservation Interest (SNCI) within 2km of the Site.

2.3.1 Critical Levels (CLe)

CLe are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The relevant CLe for the protection of vegetation and ecosystems are presented in Table 2-3.

Table 2-3: Relevant Critical Levels

Pollutant	Critical Level (µg/m^3)	Averaging Period	Habitat
NO_x	30	Annual mean	All
	200	Daily mean	Where a) ozone is below the AOT40 Critical Level and b) SO_2 is below the lower Critical Level of 10µg/m^3
	75		All other

2.3.2 Critical Loads (CLo)

CLo are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. CLo are set for the deposition of various substances to sensitive ecosystems. Deposition of nitrogen can cause eutrophication and acidification; the relevant CLo are presented in Section 4.5.

3.0 Assessment Methodology

The assessment methodology comprises dispersion modelling (see Appendix A for EA modelling checklist), with statistical analysis of the probability of short-term impacts occurring, and deposition calculations for assessment of impacts on ecological receptors.

3.1 Dispersion Modelling

3.1.1 Dispersion Model

For this assessment the AERMOD model[7] has been applied; this model is widely used and accepted by the EA for undertaking such assessments and its predictions have been validated against real-time monitoring data by the US Environmental Protection Agency (EPA). It is therefore considered a suitable model for this assessment.

Model validation studies[8] for AERMOD generally suggest that for the vast majority of cases it is able to predict maximum short-term high percentiles concentrations well within a factor of two and the latest evaluation study for AERMOD shows the composite (geometric mean) ratio of predicted to observed short-term averages from 'test sites' (where real-time monitoring data is available to validate model performance), to be between 0.96 and 1.2.

3.1.2 Model Domain and Receptors

The modelling has been undertaken using a receptor grid across a map of the study area. This allows the maximum ground level concentration outside the Site boundary to be assessed.

A nested receptor grid extending 5km from the Site was applied as follows:

- 200m x 200m at 20m grid resolution;
- 1,000m x 1,000m at 50m grid resolution;
- 2,000m x 2,000m at 200m grid resolution; and
- 5,000m x 5,000m at 500m grid resolution.

In addition, the modelling of discrete sensitive receptor locations has been undertaken to assess the impact at relevant exposure locations for annual mean impact and facilitate the discussion of results. Human and ecological receptors are discussed in the following sections.

3.1.2.1 Human Receptors

Twelve locations surrounding the Site have been selected to inform the risk assessment in terms of relevant exposure, as detailed in Table 3-1 and displayed in Figure 3-4 as HR1 to HR12.

Table 3-1: Modelled Human Receptors

Model ID	Info	X	Y	Z (m)
HR1	Residential	354407	179722	1.5
HR2	Village Hall	354769	179957	1.5
HR3	Residential	354668	180380	1.5

[7] Software used: Lakes AERMOD View, (Executable Aermod_24142).

[8] US EPA, AERMOD: Latest Features and Evaluation Results, EPA-454/R-03-003, June 2003.

Model ID	Info	X	Y	Z (m)
HR4	Residential	354791	180630	1.5
HR5	Residential	355558	180996	1.5
HR6	Residential	355740	181132	1.5
HR7	Residential	355715	181517	1.5
HR8	Residential	355990	181744	1.5
HR9	Residential	356013	182268	1.5
HR10	Hotel	355639	183013	1.5, 4.5, 7.5, 10.5, 13.5
HR11	Residential	354377	184044	1.5
HR12	Residential	354378	184167	1.5

3.1.2.2 Ecological Receptors

The designated ecological sites within the set screening distances are presented in Table 3-2 and their locations are presented in Figure 3-5 and Figure 3-6.

Table 3-2: Ecological Receptors

Ref.	Designation	Name	Approx. Distance to Site (km)
ER1	SPA / Ramsar	Severn Estuary	0.5
ER2	SAC	Severn Estuary	0.5
ER3	SAC	River Wye	9.1
ER4	SAC	Avon Gorge Woodlands	6.1
ER5	SSSI (and SNCI) [(A)]	Severn Estuary	0.5
ER6	SNCI	Avonmouth Sewage Works and Hoar Gout	1.6
ER7	SNCI	Hallen Marsh Junction	1.0
ER8	SNCI	Lawrence Weston Road Rhines	1.6
ER9	SNCI	Moorhouse Farm and Stuppill Rhines	0.3
ER10	SNCI	Salt Rhine and Moorhouse Rhine	1.3
ER11	SNCI	Impool, Middle Compton and Upper Compton Rhines	1.9

Table note:

(A) The SNCI boundaries (designated within both Bristol City Council and South Gloucestershire Council) is identical to the SSSI boundary and therefore separate consideration is not considered necessary as the SSSI assessment criteria is more stringent.

3.1.3 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

AERMOD utilises digital elevation data to determine the impact of topography on dispersion from a source. Topography was incorporated within the modelling using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights and has been incorporated into the model, as illustrated in Figure 3-1.

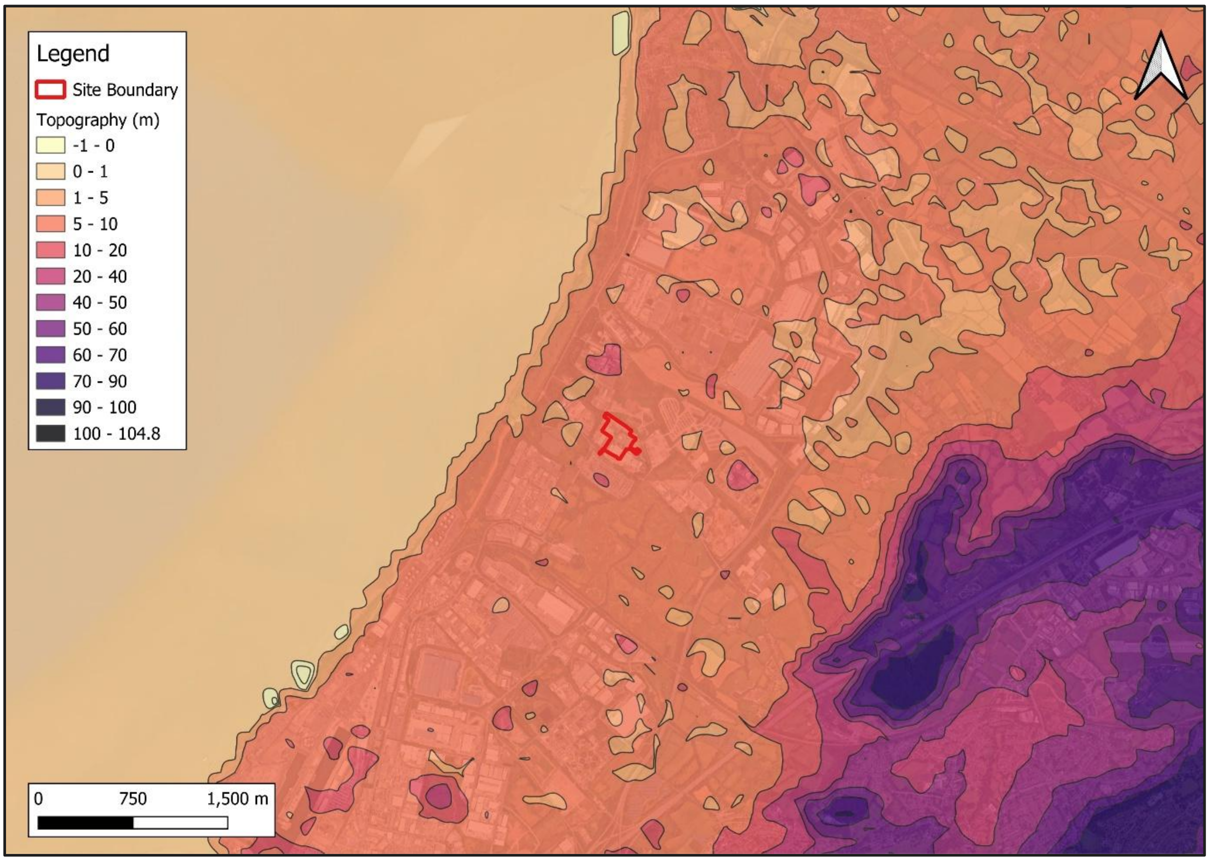

Figure 3-1: Topography

3.1.4 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations. Building downwash has been considered for buildings that have a maximum height equivalent to at least 40% of the emission height and which are within a distance defined as five times the lesser of the height or maximum projected width of the building.

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Buildings and structures input to the model are represented in Figure 3-2.

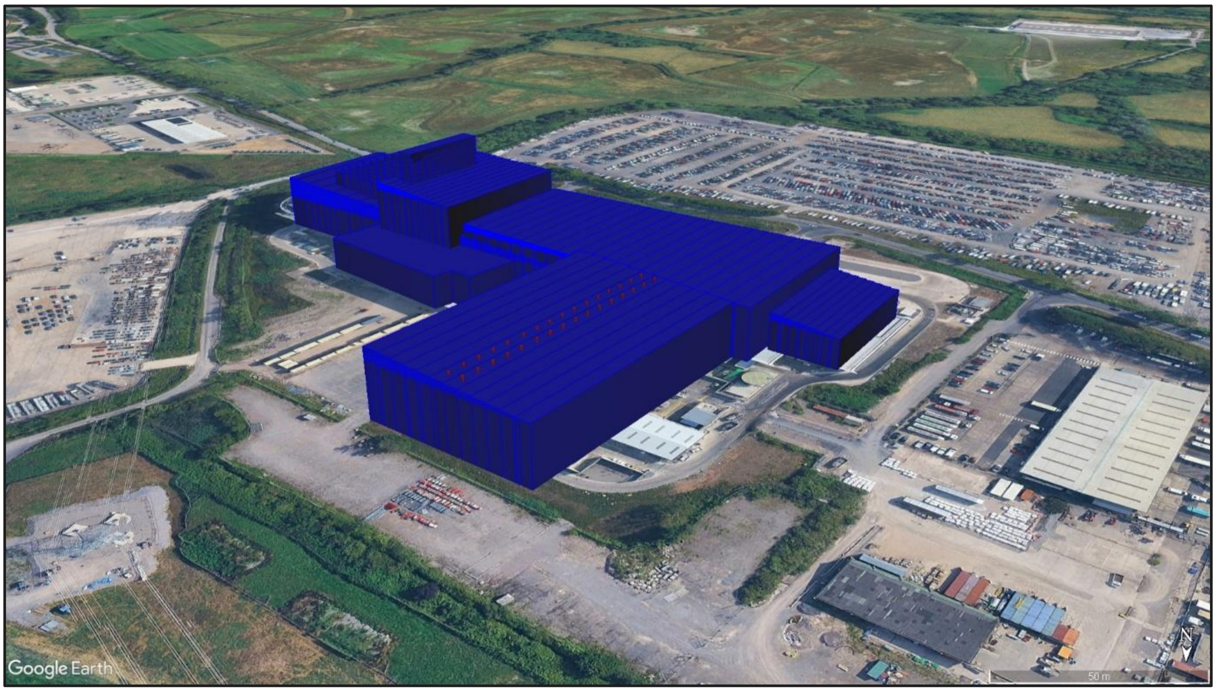

Figure 3-2: Modelled Buildings and Structures

3.1.5 Meteorological Data and Preparation

Meteorological data from the Almondsbury station (5 years of hourly sequential data for 2020-2024 inclusive) was obtained in .met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor. Details specific to the station location were used to define the surface characteristics; albedo, bowen ratio and surface roughness, applied in the conversion (see Table 3-3). A windrose is presented in Figure 3-3.

Table 3-3: Applied Surface Characteristics

Zone (Start)	Zone (End)	Albedo	Bowen Ratio	Surface Roughness (m)
15	230	0.18	0.67	0.214
230	305			0.141
305	340			0.145
340	15			0.115

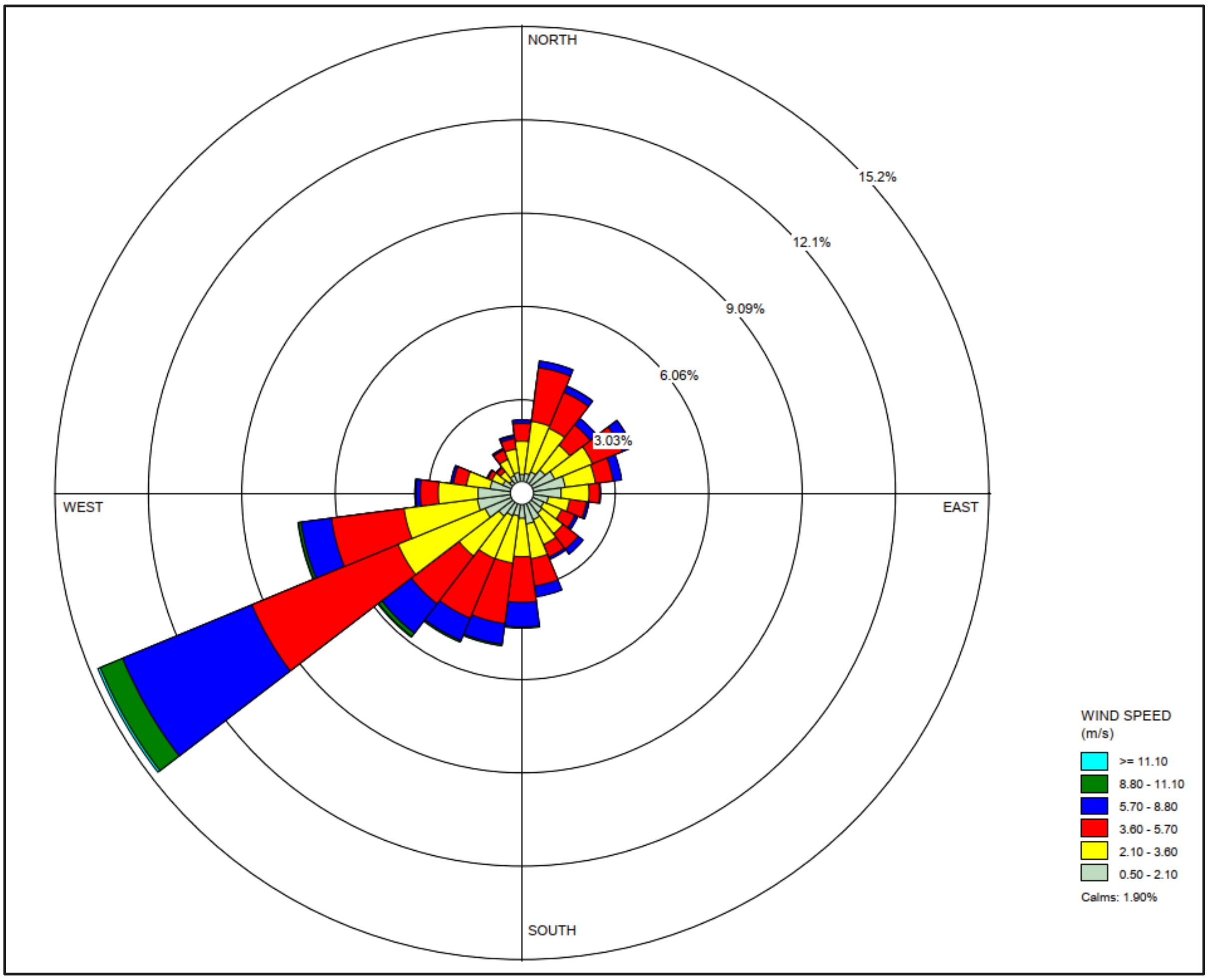

Figure 3-3: Almondsbury Windrose (2020 – 2024)

3.2 Assessment of Impacts on Air Quality

3.2.1 Treatment of Model Output

The assessment of impacts against the AQALs is undertaken using model output as described in Table 3-4.

As per the EA guidance[3] on conversion ratio for NO_x and NO_2, it has been assumed that 70% of NO_x is present as NO_2 in relation to long-term impacts and 35% of NO_x is present as NO_2 in relation to short-term impacts.

In relation to NO, it is assumed that 90% of NO_x is present as NO in relation to short-term impacts. This follows an EA decision document[9].

Table 3-4: Model Output

Averaging Period	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	99.79%ile of 1-hour means. Threshold violation file (threshold set at 200µg/m³ minus 2x annual	PC + 2 x annual mean background.

[9] Permitting Decision – Variation EPR/EP3507SL/V002 (19/12/2024).

Averaging Period	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
	mean background, converted to NOx assuming 35% of NOx present as NO_2) counts number of hours per annum exceeding threshold.	Probability of exceedance calculated as per Section 3.2.2.
NO_2 1-hour mean (US AEGL-1)	Threshold violation file (threshold set at 956µg/m^3 minus 2x annual mean background, converted to NO_x assuming 35% of NO_x present as NO_2) counts number of hours per annum exceeding threshold.	PC + 2 x annual mean background. Probability of exceedance calculated as per Section 3.2.2.
NO_2 10-min mean (US AEGL-1)	As above. PC and threshold violation file factored by 1.34	PC + 2 x annual mean background. Probability of exceedance calculated as per Section 3.2.2..
NO 1-hour mean (EAL)	Modelled as NO_x.	PC + 2 x annual mean background
Annual mean NO_2	Annual mean from 5 met. years (factored for operational hours).	PC + annual mean background
NO_x daily mean CLe	Maximum 24-hour mean (factored from the 1-hour mean 100%ile where relevant to operational hours).	PC + 2 x annual mean background
NO_x annual mean CLe / CLo	Annual mean from 5 met. years (factored for operational hours).	PC + annual mean background

3.2.2 Statistical Analysis of Short-term Impacts

To assess the likelihood of exceedances of the standards occurring from the infrequent operation of the SBGs, the following approach has been adopted:

- The impact of the SBGs has been modelled for 8,760 hours of the year to ensure that the operating hours coincide with the worst-case dispersal conditions with the model set to count the number of exceedance hours (threshold violation file in AERMOD).
- For the 1-hour mean 99.79%ile, the 'hypergeometric probability distribution' approach as defined in EA guidance[3Error! Bookmark not defined.] has been applied. The cumulative distribution factor of 2.5 is applied in the case of consecutive operating hours.
- For the 1-hour maximum (and 10-minute maximum) averaging periods, the cumulative probability has been applied (number of exceedances / valid meteorological hours x number of operating hours or start-up events).

The EA guidance provides the following framework to apply to the calculated probability of impacts occurring:

- 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.

3.2.3 Assessment of Annual Impact and Significance

To assess the potential impact on air quality, the predicted exposure is compared to the AQALs, and the results of the dispersion modelling have been presented in the form of:

- Tabulated concentrations at discrete receptor locations to facilitate the discussion of results; and
- Illustrations of the impact as isopleths (contours of concentration) for the criteria selected enabling determination of impact at any locations within the study area.

In accordance with the EA's AERA guidance, the impact is considered to be insignificant or negligible if:

- The long-term process contribution is <1% of the long term AQAL; and
- The short-term process contribution is <10% of the short term AQAL.

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

3.3 Assessment of Impacts on Vegetation and Ecosystems

3.3.1 Calculation of Contribution to Critical Loads

Deposition rates were calculated using empirical methods recommended by the EA AQTAG06[10]. Dry deposition flux was calculated using the following equation:

Dry deposition flux (μg/m^2/s) = ground level concentration (μg/m^3) x deposition velocity (m/s)

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow and is not considered significant over short distances compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered. The applied deposition velocities are as shown in Table 3-5.

Table 3-5: Applied Deposition Velocity

Chemical Species	Recommended Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

The predicted deposition rates were converted from μg/m^2/s to units of nitrogen deposition and acid equivalent deposition as detailed in Table 3-6.

Table 3-6: Applied Deposition Conversion Factors

	Conversion from NO_2 μg/m^2/s to:	Factor
N Deposition	N kg/ha/year	95.9
Acid Deposition	keq/ha/year	6.84

[10] EA, AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air, March 2014 version.

3.3.2 Calculation of PC as a Percentage of Acid CLo Function

The calculation of the process contribution of N to the acid CLo function has been carried out according to the guidance on Air Pollution Information System (APIS)[11], 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*"

3.3.3 Assessment of Impacts and Significance

In addition to the AERA guidance, the EA's Operational Instruction 66_12[12] 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 international sites, 'no likely damage' for SSSIs, or 'no significant pollution' for other sites, as follows:

- PC does not exceed 1% long-term CLe and/or CLo or that the PEC does not exceed 70% long-term CLe and/or CLo for international sites and SSSIs;
- PC does not exceed 10% short-term CLe for NOx for international sites and SSSIs;
- PC <100% long-term CLe and/or CLo for other conservation sites; and
- PC <100% short-term CLe for NOx (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 the EA's Operational Instruction 67_12[13]. This can require the 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).

The guidance provides the following further criteria:

- If the PEC does not exceed 100% of the appropriate limit it can be assumed there will be no adverse effect;
- If the background is below the limit, but a small PC leads to an exceedance – decision based on local considerations;

[11] APIS, http://www.apis.ac.uk/

[12] EA Operational Instruction 66_12 – Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.

[13] EA Operational Instruction 67_12 – Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.

- If the background is currently above the limit and the additional PC will cause a small increase – decision based on local considerations;
- If the background is below the limit, but a significant PC leads to an exceedance – cannot conclude no adverse effect; and
- If the background is currently above the limit and the additional PC is large – cannot conclude no adverse effect.

Figure 3-4: Modelled Human Receptor Locations

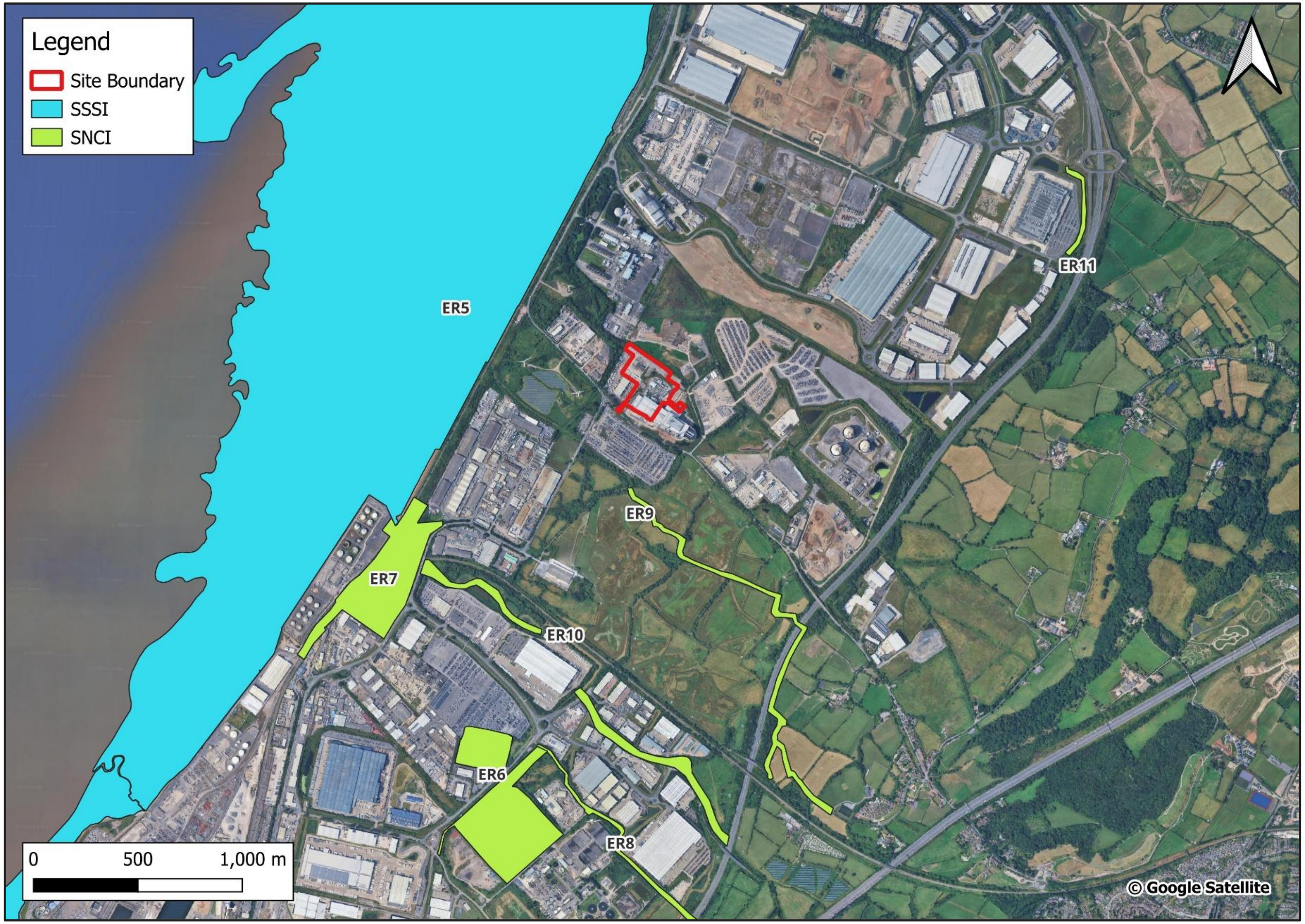

Figure 3-5: Modelled Ecological Receptor Locations (2km)

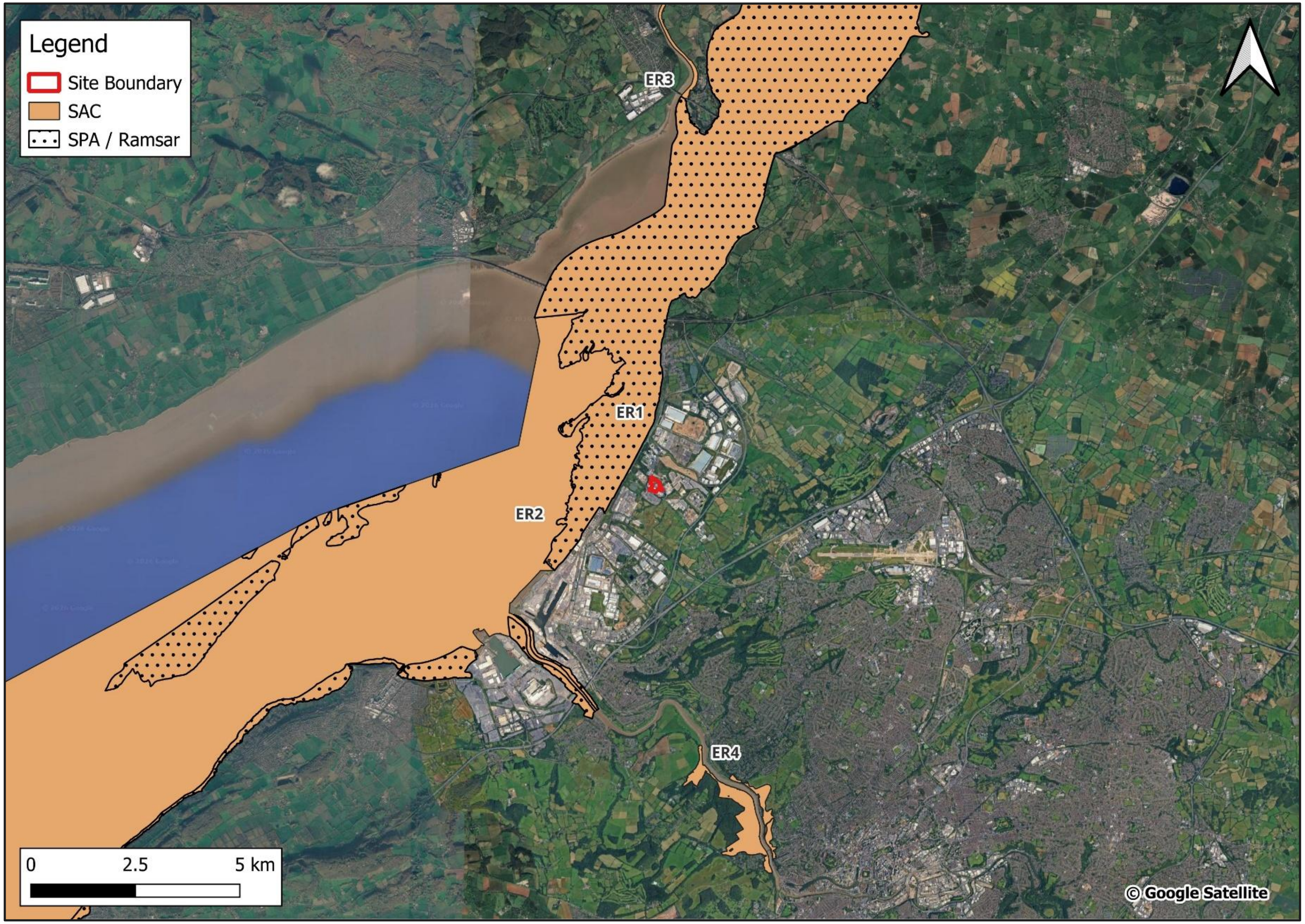

Figure 3-6: Modelled Ecological Receptor Locations (10km)

4.0 Baseline Environment

4.1 LAQM Review and Assessment

The Site is in Bristol City Council (BCC), however <100m from the boundary of South Gloucestershire Council (SGC). Both Councils have conducted exercises to review and assess air quality within their administrative areas.

The most recent Air Quality Annual Status Reports[14, 15] have been reviewed.

BCC presently has one declared AQMA ('Bristol AQMA'). The Bristol AQMA covers the city centre and main radial routes and is located >7km from the Site. SGC presently has two declared AQMAs, however both are located >12km from the Site.

AQMAs have therefore not been considered further in this assessment.

4.2 Review of Air Quality Monitoring

The BCC and SGC monitoring networks have been reviewed. The closest monitoring locations to the Site are passive NO_2 diffusion tubes.

The details and results are presented in Table 4-1 and Table 4-2 respectively, whilst their locations are illustrated in Figure 4-1.

All monitoring data presented has been ratified by BCC or SGC. Pollutant concentrations monitored during 2020 and 2021 (i.e. affected by the COVID-19 pandemic) are expected to be atypical.

Table 4-1: LAQM Diffusion Tube Monitoring Sites: Details

Site ID	Site Type	NGR (m)		Approx. Distance to Site (km)
		X	Y	
16	Roadside	352287	178698	3.3
38	Urban Background	354282	184653	2.7

Table 4-2: LAQM Diffusion Tube Monitoring Sites: Results

Site ID	Valid Data Capture 2024 (%)	Annual Mean NO_2 Concentration (µg/m^3)				
		2020	2021	2022	2023	2024
16	100	23.2	24.9	25.8	21.5	21.5
38	-	9.8	10.8	12.4	8.8	-

As displayed in Table 4-2, annual mean NO_2 concentrations at the monitors have been well below the annual mean AQAL (40µg/m^3) across the period presented, with post COVID-19 concentrations following a downward trend.

The empirical relationship given in LAQM.TG22 states that exceedances of the 1-hour mean AQAL for NO_2 is unlikely to occur where annual mean concentrations are <60µg/m^3. This indicates that an exceedance of the 1-hour mean AQAL was unlikely to have occurred at the monitors presented for the period assessed.

[14] Bristol City Council, 2025 Air Quality Annual Status Report, June 2025.

[15] South Gloucestershire Council, 2024 Air Quality Annual Status Report, July 2024.

4.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution. The data sets include annual average concentration estimates for NO_x and NO_2 using a reference year of 2021 (the year in which comparisons between modelled and monitored concentrations are made)[16]. From review of the emissions inventory, key emission sources in the area are captured in the background maps, including Avonmouth EfW, SevernSide EfW and Seabank Power.

The Defra mapped annual mean background concentrations for the base year adopted (2024 – the latest year of BCC monitoring data) for the grid squares containing the Site and modelled human receptor locations are presented in Table 4-3.

The mapped background concentrations are well below the respective annual mean AQALs.

Table 4-3: Defra Background Pollutant Concentrations (2024)

Grid Square (X, Y)	Annual Mean Background Concentration (µg/m^3)	
	NO_x	NO_2
353500, 181500	16.9	12.6
353500, 182500	11.6	8.9
354500, 179500	14.0	10.7
354500, 180500	11.6	8.9
355500, 180500	12.2	9.4
355500, 181500	12.1	9.3
356500, 182500	10.0	7.8
355500, 183500	11.9	9.2
354500, 184500	10.4	8.1
AQAL	**-**	***40***

4.4 Application of Baseline Data

An annual mean NO_2 background concentration of 21.5µg/m^3 has been applied in the assessment. This was measured at BCC diffusion tube 16 in 2024. Use of diffusion tube 16 presents a reasonable approach for roadside receptors but is precautionary and likely to overestimate background concentrations at more rural receptor locations.

In relation to NO, an annual mean concentration of 15.1µg/m^3 has been applied. This was measured at the Bristol Temple Way Automatic Urban and Rural Monitoring (AURN) network monitor during 2024[17].

4.5 Baseline Conditions at Ecological Receptors

The APIS is a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology.

[16] Defra, Background Mapping data for local authorities - 2021.

[17] https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00631.

APIS, and Defra's compliance data hub[18], in addition to online literature sources and satellite imagery has been used to provide information on:

- Identification of whether the habitats present are sensitive to effects caused by potential emissions;
- Current baseline concentrations (Table 4-4);
- CLo functions for acidity (Table 4-5); and
- Background ozone concentrations (Table 4-6).

The APIS 'Search by Location' function was used to facilitate the data collection, and the NGR of the maximum annual NOx PC during testing and maintenance was used as the input.

Table 4-4: Baseline Levels, Nitrogen Critical Loads and Current Loads

ID	APIS CLo Class	Annual Mean (µg/m^3)		CLo Applied (kg N/ha/yr)	Current Load (kg N/ha/yr)
		NO_x	SO_2		
ER1	Atlantic upper-mid & mid-low salt marshes	12.5	1.2	10	13.6
ER2	Atlantic upper-mid & mid-low salt marshes	12.5	1.2	10	13.6
ER3	Raised and blanket bogs	8.5	1.0	5	14.2
ER4	Semi-dry Perennial calcareous grassland (basic meadow steppe).	15.3	1.3	10	14.0
ER5	Atlantic upper-mid & mid-low salt marshes	12.5	1.2	10	13.6
ER6	Atlantic upper-mid & mid-low salt marshes	13.6	1.3	10	13.3
ER7	Atlantic upper-mid & mid-low salt marshes	12.9	1.3	10	13.3
ER8	Atlantic upper-mid & mid-low salt marshes	13.6	1.3	10	13.3
ER9	Atlantic upper-mid & mid-low salt marshes	15.9	2.1	10	13.4
ER10	Atlantic upper-mid & mid-low salt marshes	12.9	1.3	10	13.3
ER11	Atlantic upper-mid & mid-low salt marshes	12.6	1.1	10	13.7

Table 4-5: Acid Critical Load Functions and Current Loads

ID	APIS CLo Class	CLo Function (keq/ha/yr)			Current Load (keq/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
ER1	Freshwater (A)	4.0	0.9	4.9	1.0	0.1

[18] https://compliance-data.defra.gov.uk/

ID	APIS CLo Class	CLo Function (keq/ha/yr)			Current Load (keq/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
ER2	Freshwater [(A)]	4.0	0.9	4.9	1.0	0.1
ER3	Bogs	0.2	0.3	0.5	1.0	0.1
ER4	Unmanaged Broadleafed / Coniferous Woodland	1.1	0.1	1.2	1.8	0.2
ER5	Calcareous grassland (using base cation)	4.0	0.9	4.9	1.0	0.1
ER6	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.0	0.1
ER7	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.0	0.1
ER8	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.0	0.1
ER9	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.0	0.1
ER10	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.0	0.1
ER11	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.0	0.1

Table note:

(A) Freshwater habitat is not sensitive to acid deposition. The values from the underlying SSSI (ER5) have been adopted to facilitate an assessment.

Table 4-6: Background Ozone Concentrations (2024)

ID	Relevant Grid Square (X, Y)	AOT40c (µg/m^3 hours)
ER1	352500, 182500	4,141
ER2	352500, 182500	4,141
ER3	354500, 191500	4,006
ER4	356500, 173500	4,311
ER5	352500, 182500	4,141
ER6	353500, 180500	4,017
ER7	352500, 181500	4,101
ER8	353500, 180500	4,017
ER9	353500, 181500	4,075
ER10	352500, 181500	4,101
ER11	355500, 182500	4,045
	CLe	***6,000***

On review of annual mean SO_2 concentrations (Table 4-4) and background ozone concentrations (Table 4-6), these are all below the relevant CLe.

Given this, it is appropriate to apply the 24-hour mean CLe of 200µg/m^3 in the assessment.

Figure 4-1: Local Monitoring Locations Relative to Site

5.0 Emissions to Atmosphere

5.1 Emission Points

The emission points to air comprise 32 containerised SBGs. Each generator has a thermal rated input of 7.29 MWth and an output of 2.424 MWe.

5.2 Operational Scenarios

The proposed data centre operating scenarios assessed include the following:

- Routine Testing and Maintenance – the predictable, managed testing and maintenance activity for the standby generators.
- Emergency Outage – the unpredictable emergency grid outage any time during the year requiring the maximum plant to operate for the required outage duration.
- Commissioning of the proposed SBGs.

The approach to modelling each operating scenario and the assumptions made are presented in Table 5-1.

Table 5-1: Operational Scenarios

Operational Scenarios		Model Assumptions / Scenarios
Routine Testing and Maintenance	On-load test (100% load): Each generator tested individually. Once every 6-months for 6 hours.	Equates to 12 hours of testing per generator per year (2 x 6 hours). A total of 384 hours for 32 generators (12 hours x 32 generators). As a precautionary modelling approach it has been assumed that two of these tests (i.e. 12 hours) could occur sequentially in a 24-hour period.
	Off-load test (0% load): Each generator tested individually. 15-minutes every month.	Emissions at 10% load assumed. Testing equates to 3 hours of testing per generator per year (12 months x 0.25 hours). However, emissions are time-weighted for 1-hour timestep of the dispersion model and therefore 384 hours have been considered to assess annual mean impacts. It is assumed that all 32 of these tests (i.e. 8 hours) could occur in a 24-hour period.
Emergency Outage	All generators operate to provide back-up power to the data centre.	Modelled for a hypothetical outage scenario of 72 hours.
Commissioning	Tests associated with the commissioning of each SBG. Each generator undergoes 12 hours of testing individually, at 100% load.	Equates to 12 hours of testing per generator. A total of 384 hours for 32 generators (12 hours x 32 generators).

As presented in Table 5-1, commissioning does not present a worse impact than routine testing and maintenance as generators are commissioned individually, and the number of hours is less.

Therefore, a cumulative scenario has been considered which assumes that the commissioning of the 32 SBGs occurs in the same year as their routine testing and maintenance.

5.3 Emission Parameters

The emission parameters applied in the modelling are provided in Table 5-2. These parameters have been input on the basis of manufacturer's design and specifications.

Table 5-2: Emission Parameters

Parameter / Source	MTU 20V4000G34F	
Load	100%	10%
Stack Height (m)	26	
Flow (Am^3/s)	10.3	3.1
Stack Diameter (m)	0.545	
Velocity (m/s)	44.2	13.5
Emission Temperature (°C)	524	226
Flow (Nm^3/s)	2.3 [(A)]	0.5 [(B)]
NO_x Concentration (mg/Nm^3)	2000	2860
NO_x Emission (g/s)	4.7	1.4
NO_x Emission (g/s) (time weighted for 15-minute test)	n/a	0.3

(A) Normalised to 273K, dry, 5% O_2 assuming in-stack O_2 concentration of 9.4% dry and H_2O of 8.35%.

(B) Normalised to 273K, dry, 5% O_2 assuming in-stack O_2 concentration of 16.2% dry and H_2O of 8.35%.

6.0 Assessment Results

This section presents the results from the dispersion modelling assessment. Contour plots are presented in Appendix B.

6.1 Routine Testing and Maintenance

6.1.1 Annual Mean NO_2 Impacts

Predicted annual mean NO_2 impacts at the modelled receptor locations are summarised in Table 6-1. A contour plot is presented in Figure B-1.

The PCs are <1% of the AQAL and therefore 'insignificant'. There are no exceedances of the AQAL predicted.

Table 6-1: Testing and Maintenance – Annual Mean NO_2 AQAL

ID	PC (µg/m³)	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL
HR1	0.01	0.03%	21.5	53.8%
HR2	0.01	0.02%	21.5	53.8%
HR3	0.01	0.04%	21.5	53.8%
HR4	0.02	0.04%	21.5	53.8%
HR5	0.01	0.03%	21.5	53.8%
HR6	0.01	0.03%	21.5	53.8%
HR7	0.02	0.05%	21.5	53.8%
HR8	0.02	0.04%	21.5	53.8%
HR9	0.02	0.06%	21.5	53.8%
HR10	0.04	0.09%	21.5	53.8%
HR11	0.02	0.04%	21.5	53.8%
HR12	0.02	0.04%	21.5	53.8%

6.1.2 1-hour Mean NO_2 Impacts

6.1.2.1 AQAL

As presented in Table 6-2, the 1-hour mean (99.79%ile) NO_2 PCs and PECs are well below the AQAL at the modelled receptor locations. No exceedance counts are recorded and there is no risk of exceeding the AQAL.

Table 6-2: Testing and Maintenance – 1-hour Mean (99.79%ile) NO_2 AQAL

ID	PC	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL	Exceedance Counts	Probability of Exceedance
HR1	16.4	8.2	59.4	29.7	0	0%
HR2	13.0	6.5	56.0	28.0	0	0%
HR3	17.1	8.5	60.1	30.0	0	0%
HR4	18.0	9.0	61.0	30.5	0	0%

ID	PC	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL	Exceedance Counts	Probability of Exceedance
HR5	16.5	8.2	59.5	29.7	0	0%
HR6	15.2	7.6	58.2	29.1	0	0%
HR7	23.0	11.5	66.0	33.0	0	0%
HR8	17.1	8.6	60.1	30.1	0	0%
HR9	15.8	7.9	58.8	29.4	0	0%
HR10	13.9	7.0	56.9	28.5	0	0%
HR11	3.3	1.7	46.3	23.2	0	0%
HR12	3.4	1.7	46.4	23.2	0	0%

Furthermore, during routine testing and maintenance (where only one generator operates at a time), there are no occurrences on the modelled receptor grid where the PEC exceeds 200µg/m^3. As there is no risk of exceedance, 1-hour mean NO_2 impacts are considered insignificant.

6.1.2.2 AEGL

The 1-hour mean and 10-minute mean (100%ile) NO_2 PCs and PECs are well below the AEGL-1 at the modelled receptor locations (Table 6-3 and Table 6-4). No exceedance counts are recorded and there is no risk of exceeding the AEGL-1.

Table 6-3: Testing and Maintenance – 1-hour Mean NO_2 AEGL

ID	PC	PC as % of AEGL	PEC (µg/m^3)	PEC as % of AEGL	Exceedance Counts	Probability of Exceedance
HR1	24.3	2.5%	67.3	7.0%	0	0%
HR2	25.0	2.6%	68.0	7.1%	0	0%
HR3	28.5	3.0%	71.5	7.5%	0	0%
HR4	30.8	3.2%	73.8	7.7%	0	0%
HR5	27.9	2.9%	70.9	7.4%	0	0%
HR6	30.9	3.2%	73.9	7.7%	0	0%
HR7	31.8	3.3%	74.8	7.8%	0	0%
HR8	23.9	2.5%	66.9	7.0%	0	0%
HR9	21.4	2.2%	64.4	6.7%	0	0%
HR10	16.5	1.7%	59.5	6.2%	0	0%
HR11	10.7	1.1%	53.7	5.6%	0	0%
HR12	9.8	1.0%	52.8	5.5%	0	0%

Table 6-4: Testing and Maintenance – 10-minute Mean NO_2 AEGL

ID	PC	PC as % of AEGL	PEC (µg/m^3)	PEC as % of AEGL	Exceedance Counts	Probability of Exceedance
HR1	32.5	3.4%	75.5	7.9%	0	0%
HR2	33.5	3.5%	76.5	8.0%	0	0%
HR3	38.1	4.0%	81.1	8.5%	0	0%
HR4	41.3	4.3%	84.3	8.8%	0	0%
HR5	37.4	3.9%	80.4	8.4%	0	0%
HR6	41.5	4.3%	84.5	8.8%	0	0%
HR7	42.6	4.5%	85.6	9.0%	0	0%
HR8	32.1	3.4%	75.1	7.9%	0	0%
HR9	28.7	3.0%	71.7	7.5%	0	0%
HR10	22.1	2.3%	65.1	6.8%	0	0%
HR11	14.3	1.5%	57.3	6.0%	0	0%
HR12	13.1	1.4%	56.1	5.9%	0	0%

6.1.3 1-hour Mean NO Impacts

The 1-hour mean NO PCs and PECs are well below the AQAL at the modelled receptor locations (Table 6-5). No exceedances are recorded.

Table 6-5: Testing and Maintenance – 1-hour Mean NO AQAL

ID	PC	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
HR1	62	1.4%	93	2.1%
HR2	64	1.5%	94	2.1%
HR3	73	1.7%	103	2.3%
HR4	79	1.8%	110	2.5%
HR5	72	1.6%	102	2.3%
HR6	80	1.8%	110	2.5%
HR7	82	1.9%	112	2.5%
HR8	62	1.4%	92	2.1%
HR9	55	1.2%	85	1.9%
HR10	43	1.0%	73	1.7%
HR11	28	0.6%	58	1.3%
HR12	25	0.6%	55	1.3%

6.1.4 Impact on Critical Levels

The annual mean NO_x impacts are presented in Table 6-6.

At ER1 to ER5, the PCs are <1% and therefore insignificant. Impacts are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, and ‘no likely damage’ to ER5.

The PC is <100% at ER6 to ER11 and therefore considered to cause ‘no significant pollution’.

Table 6-6: Testing and Maintenance – Annual Mean NO_x Critical Level

ID	Designation	NO_x PC	PC as % of AQAL	NO_x PEC (µg/m^3)	PEC as % of AQAL
ER1	SPA / Ramsar	0.09	0.3%	12.6	42.0%
ER2	SAC	0.09	0.3%	12.6	42.0%
ER3	SAC	<0.01	<0.1%	8.5	28.3%
ER4	SAC	0.01	<0.1%	15.3	51.0%
ER5	SSSI / SNCI	0.09	0.3%	12.6	42.0%
ER6	SNCI	0.02	0.1%	13.6	45.4%
ER7	SNCI	0.05	0.2%	13.0	43.2%
ER8	SNCI	0.02	0.1%	13.6	45.4%
ER9	SNCI	0.17	0.6%	16.1	53.6%
ER10	SNCI	0.03	0.1%	13.0	43.2%
ER11	SNCI	0.05	0.2%	12.7	42.3%

The 24-hour mean NO_x impacts are presented in Table 6-7.

At ER1 to ER5, where the PC is >10%, the PECs are still well below the CLe. Impacts are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, and ‘no likely damage’ to ER5.

The PC is <100% at ER6 to ER11 and therefore considered to cause ‘no significant pollution’.

Table 6-7: Testing and Maintenance – 24-hour Mean NO_x Critical Level

ID	Designation	PC	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
ER1	SPA / Ramsar	64.9	32.4%	89.9	44.9%
ER2	SAC	64.9	32.4%	89.9	44.9%
ER3	SAC	2.9	1.4%	19.9	9.9%
ER4	SAC	36.3	18.2%	66.9	33.5%
ER5	SSSI / SNCI	64.9	32.4%	89.9	44.9%
ER6	SNCI	36.3	18.1%	63.5	31.7%
ER7	SNCI	45.2	22.6%	71.1	35.5%
ER8	SNCI	42.1	21.1%	69.3	34.7%
ER9	SNCI	73.2	36.6%	105.1	52.5%
ER10	SNCI	47.9	23.9%	73.7	36.9%
ER11	SNCI	28.0	14.0%	53.3	26.6%

6.1.5 Impact on Critical Loads

The impacts on the nitrogen deposition and acid CLo are presented in Table 6-8 and Table 6-9.

At ER1 to ER5, the PCs are <1% and therefore insignificant. Impacts are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, and ‘no likely damage’ to ER5.

At ER6 to ER11, the nitrogen PCs are less than 100% and therefore considered to cause ‘no significant pollution’. These sites are not sensitive to acidic N deposition.

Table 6-8: Testing and Maintenance – Nitrogen Deposition Critical Load

ID	Designation	Applied CLo (kg N/ha/yr)	Annual Mean PC (kg N/ha/yr)	PC as % of CLo
ER1	SPA / Ramsar	10	0.009	0.09%
ER2	SAC	10	0.009	0.09%
ER3	SAC	5	<0.001	0.01%
ER4	SAC	10	0.001	0.01%
ER5	SSSI / SNCI	10	0.009	0.09%
ER6	SNCI	10	0.002	0.02%
ER7	SNCI	10	0.005	0.05%
ER8	SNCI	10	0.002	0.02%
ER9	SNCI	10	0.017	0.17%
ER10	SNCI	10	0.004	0.04%
ER11	SNCI	10	0.005	0.05%

Table 6-9: Testing and Maintenance – Acid Deposition Critical Load

ID	Designation	CLo Function for Assessment	CLo for Assessment (keq/ha/yr)	PC (keq/ha/yr)	PC as % of CLo
ER1	SPA / Ramsar	CLmaxN	4.86	0.001	0.01%
ER2	SAC	CLmaxN	4.86	0.001	0.01%
ER3	SAC	CLmaxN	0.49	<0.001	<0.01%
ER4	SAC	CLmaxN	1.22	<0.001	0.01%
ER5	SSSI / SNCI	CLmaxN	4.86	0.001	0.01%
ER6	SNCI	CLmaxS	S sensitive / not sensitive to acidic N deposition.		
ER7	SNCI	CLmaxS			
ER8	SNCI	CLmaxS			
ER9	SNCI	CLmaxS			
ER10	SNCI	CLmaxS			
ER11	SNCI	CLmaxS			

6.2 Emergency Outage (72-hours)

6.2.1 Annual Mean NO_2 Impacts

Predicted annual mean NO_2 impacts at the modelled receptor locations for a 72-hour emergency outage are summarised in Table 6-10.

The PCs are <1% of the AQAL and therefore 'insignificant'. There are no exceedances of the AQAL predicted.

Table 6-10: Emergency Outage – Annual Mean NO_2 AQAL

ID	PC (µg/m^3)	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
HR1	0.1	0.1%	21.6	53.9%
HR2	0.1	0.1%	21.6	53.9%
HR3	0.1	0.2%	21.6	54.0%
HR4	0.1	0.2%	21.6	54.0%
HR5	0.1	0.1%	21.6	53.9%
HR6	0.1	0.2%	21.6	53.9%
HR7	0.1	0.2%	21.6	54.0%
HR8	0.1	0.3%	21.6	54.0%
HR9	0.2	0.4%	21.7	54.1%
HR10	0.2	0.5%	21.7	54.2%
HR11	0.1	0.2%	21.6	54.0%
HR12	0.1	0.2%	21.6	54.0%

6.2.2 1-hour Mean NO_2 Impacts

6.2.2.1 AQAL

Table 6-11 presents the probability of exceedances of the 1-hour mean NO_2 AQAL occurring for a 72-hour emergency outage. The probability of exceedance of the AQAL is <1% and therefore 'highly unlikely' at all the modelled receptor locations.

Table 6-11: Emergency Outage – 1-hour Mean (99.79%ile) NO_2 AQAL

ID	PC	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL	Exceedance Counts	Probability of Exceedance
HR1	500	250.1%	543	271.6%	48	0%
HR2	432	216.1%	475	237.6%	36	0%
HR3	657	328.3%	700	349.8%	55	0%
HR4	682	341.0%	725	362.5%	62	0%
HR5	542	271.2%	585	292.7%	36	0%
HR6	456	227.9%	499	249.4%	51	0%
HR7	711	355.3%	754	376.8%	74	0%
HR8	588	294.1%	631	315.6%	68	0%

ID	PC	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL	Exceedance Counts	Probability of Exceedance
HR9	649	324.5%	692	346.0%	104	0%
HR10	608	304.0%	651	325.5%	80	0%
HR11	208	103.8%	251	125.3%	20	0%
HR12	179	89.7%	222	111.2%	19	0%

6.2.2.2 AEGL

As displayed in Table 6-12 and Table 6-13, for a 72-hour emergency outage, there are potential exceedances of the 1-hour mean and 10-minute mean AEGL-1 at some of the modelled receptor locations.

In relation to the 1-hour mean AEGL-1, this occurs at HR3 and HR4 only, but the probability is less than 5% and therefore considered 'unlikely'. For the 10-minute mean AEGL-1 this occurs at several of the receptors, except HR11 and HR12. These outcomes rely on the occurrence of a prolonged outage. Exceedances of the AEGL-1 are not substantial and predicted concentrations are an order of magnitude below the AEGL-2.

Table 6-12: Emergency Outage – 1-hour Mean NO_2 AEGL-1

ID	PC	PC as % of AEGL	PEC (µg/m³)	PEC as % of AEGL	Exceedance Counts	Probability of Exceedance
HR1	820	85.8%	863	90.3%	0	0.0%
HR2	853	89.2%	896	93.7%	0	0.0%
HR3	967	101.2%	1010	105.7%	3	2.5%
HR4	988	103.3%	1031	107.8%	3	2.5%
HR5	847	88.6%	890	93.1%	0	0.0%
HR6	841	88.0%	884	92.5%	0	0.0%
HR7	901	94.3%	944	98.8%	0	0.0%
HR8	815	85.3%	858	89.8%	0	0.0%
HR9	772	80.8%	815	85.3%	0	0.0%
HR10	734	76.8%	777	81.3%	0	0.0%
HR11	519	54.3%	562	58.8%	0	0.0%
HR12	478	50.0%	521	54.5%	0	0.0%

Table 6-13: Emergency Outage – 10-minute Mean NO_2 AEGL-1

ID	PC	PC as % of AEGL	PEC (µg/m³)	PEC as % of AEGL	Exceedance Counts	Probability of Exceedance
HR1	1099	115.0%	1142	119.5%	7	5.8%
HR2	1143	119.5%	1186	124.0%	11	9.0%
HR3	1296	135.6%	1339	140.1%	17	14.0%
HR4	1324	138.5%	1367	143.0%	19	15.6%

ID	PC	PC as % of AEGL	PEC (µg/m³)	PEC as % of AEGL	Exceedance Counts	Probability of Exceedance
HR5	1134	118.7%	1177	123.2%	9	7.4%
HR6	1127	117.9%	1170	122.4%	9	7.4%
HR7	1207	126.3%	1250	130.8%	23	18.9%
HR8	1092	114.3%	1135	118.8%	12	9.9%
HR9	1035	108.3%	1078	112.8%	12	9.9%
HR10	983	102.9%	1026	107.4%	12	9.9%
HR11	696	72.8%	739	77.3%	0	0.0%
HR12	640	67.0%	683	71.5%	0	0.0%

6.2.3 1-hour Mean NO Impacts

The 1-hour mean NO PCs and PECs are well below the AQAL at the modelled receptor locations (Table 6-14). No exceedances are recorded.

Table 6-14: Emergency Outage – 1-hour Mean NO AQAL

ID	PC	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL
HR1	2109	47.9%	2140	48.6%
HR2	2193	49.8%	2223	50.5%
HR3	2487	56.5%	2518	57.2%
HR4	2540	57.7%	2570	58.4%
HR5	2177	49.5%	2207	50.2%
HR6	2163	49.2%	2193	49.8%
HR7	2317	52.7%	2347	53.3%
HR8	2096	47.6%	2126	48.3%
HR9	1986	45.1%	2017	45.8%
HR10	1887	42.9%	1917	43.6%
HR11	1335	30.3%	1365	31.0%
HR12	1228	27.9%	1258	28.6%

6.2.4 Impact on Critical Levels

The annual mean NO_x impacts are presented in Table 6-15.

At ER1 to ER5, where the PC is >1%, the PECs are still well below the CLe. Impacts are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, and ‘no likely damage’ to ER5.

The PC is <100% at ER6 to ER11 and therefore considered to cause ‘no significant pollution’.

Table 6-15: Emergency Outage – Annual Mean NO_x Critical Level

ID	Designation	NO_x PC	PC as % of AQAL	NO_x PEC (µg/m^3)	PEC as % of AQAL
ER1	SPA / Ramsar	0.46	1.5%	13.0	43.2%
ER2	SAC	0.46	1.5%	13.0	43.2%
ER3	SAC	0.02	0.1%	8.5	28.4%
ER4	SAC	0.04	0.1%	15.3	51.1%
ER5	SSSI / SNCI	0.46	1.5%	13.0	43.2%
ER6	SNCI	0.12	0.4%	13.7	45.7%
ER7	SNCI	0.23	0.8%	13.2	43.8%
ER8	SNCI	0.13	0.4%	13.7	45.8%
ER9	SNCI	0.90	3.0%	16.8	56.0%
ER10	SNCI	0.17	0.6%	13.1	43.6%
ER11	SNCI	0.30	1.0%	12.9	43.1%

The 24-hour mean NO_x impacts are presented in Table 6-16.

Exceedances of the CLe are predicted at all of the designated ecological sites, except ER3. This is on the worst-case assumption that an emergency outage lasts >24 hours and the maximum 24-hour period is presented.

Table 6-16: Emergency Outage – 24-hour Mean NO_x Critical Level

ID	Designation	NO_x PC	PC as % of AQAL	NO_x PEC (µg/m^3)	PEC as % of AQAL
ER1	SPA / Ramsar	845.8	422.9%	870.8	435.4%
ER2	SAC	845.8	422.9%	870.8	435.4%
ER3	SAC	25.1	12.5%	42.1	21.0%
ER4	SAC	185.0	92.5%	215.6	107.8%
ER5	SSSI / SNCI	845.8	422.9%	870.8	435.4%
ER6	SNCI	282.2	141.1%	309.4	154.7%
ER7	SNCI	510.3	255.1%	536.1	268.1%
ER8	SNCI	315.4	157.7%	342.6	171.3%
ER9	SNCI	1400.8	700.4%	1432.6	716.3%
ER10	SNCI	451.1	225.5%	476.9	238.5%
ER11	SNCI	363.2	181.6%	388.5	194.2%

6.2.5 Impact on Critical Loads

The impacts on the nitrogen deposition and acid CLo are presented in Table 6-17 and Table 6-18.

At ER1 to ER5, the PCs are <1% and therefore insignificant. Impacts are considered to cause 'no likely significant effects' to ER1, ER2, ER3 and ER4, and 'no likely damage' to ER5.

At ER6 to ER11, the nitrogen PCs are less than 100% and therefore considered to cause 'no significant pollution'. These sites are not sensitive to acidic N deposition.

Table 6-17: Emergency Outage – Nitrogen Deposition Critical Load

ID	Designation	Applied CLo (kg N/ha/yr)	Annual Mean PC (kg N/ha/yr)	PC as % of CLo
ER1	SPA / Ramsar	10	0.05	0.46%
ER2	SAC	10	0.05	0.46%
ER3	SAC	5	0.00	0.04%
ER4	SAC	10	0.00	0.04%
ER5	SSSI / SNCI	10	0.05	0.46%
ER6	SNCI	10	0.01	0.12%
ER7	SNCI	10	0.02	0.24%
ER8	SNCI	10	0.01	0.13%
ER9	SNCI	10	0.09	0.90%
ER10	SNCI	10	0.02	0.17%
ER11	SNCI	10	0.03	0.30%

Table 6-18: Emergency Outage – Acid Deposition Critical Load

<table>
<tr><th>ID</th><th>Designation</th><th>CLo Function for Assessment</th><th>CLo for Assessment (keq/ha/yr)</th><th>PC (keq/ha/yr)</th><th>PC as % of CLo</th></tr>
<tr><td>ER1</td><td>SPA / Ramsar</td><td>CLmaxN</td><td>4.86</td><td>0.003</td><td>0.07%</td></tr>
<tr><td>ER2</td><td>SAC</td><td>CLmaxN</td><td>4.86</td><td>0.003</td><td>0.07%</td></tr>
<tr><td>ER3</td><td>SAC</td><td>CLmaxN</td><td>0.49</td><td><0.001</td><td>0.03%</td></tr>
<tr><td>ER4</td><td>SAC</td><td>CLmaxN</td><td>1.22</td><td>0.001</td><td>0.05%</td></tr>
<tr><td>ER5</td><td>SSSI / SNCI</td><td>CLmaxN</td><td>4.86</td><td>0.003</td><td>0.07%</td></tr>
<tr><td>ER6</td><td>SNCI</td><td>CLmaxS</td><td rowspan="6" colspan="3">S sensitive / not sensitive to acidic N deposition.</td></tr>
<tr><td>ER7</td><td>SNCI</td><td>CLmaxS</td></tr>
<tr><td>ER8</td><td>SNCI</td><td>CLmaxS</td></tr>
<tr><td>ER9</td><td>SNCI</td><td>CLmaxS</td></tr>
<tr><td>ER10</td><td>SNCI</td><td>CLmaxS</td></tr>
<tr><td>ER11</td><td>SNCI</td><td>CLmaxS</td></tr>
</table>

6.3 Commissioning

This has considered the commissioning of the 32 generators in the same year as their routine testing and maintenance. Short-term impacts would be no worse than those already presented and therefore cumulative annual mean impacts are considered.

6.3.1 Annual Mean NO_2 Impacts

Predicted annual mean NO_2 impacts at the modelled receptor locations are summarised in Table 6-19.

The PCs are <1% of the AQAL and therefore 'insignificant'. There are no exceedances of the AQAL predicted.

Table 6-19: Commissioning (Cumulative) – Annual Mean NO_2 AQAL

ID	PC (µg/m^3)	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
HR1	0.02	0.05%	21.5	53.8%
HR2	0.02	0.04%	21.5	53.8%
HR3	0.03	0.07%	21.5	53.8%
HR4	0.03	0.07%	21.5	53.8%
HR5	0.02	0.05%	21.5	53.8%
HR6	0.02	0.06%	21.5	53.8%
HR7	0.04	0.09%	21.5	53.8%
HR8	0.03	0.08%	21.5	53.8%
HR9	0.05	0.12%	21.5	53.9%
HR10	0.07	0.17%	21.6	53.9%
HR11	0.03	0.08%	21.5	53.8%
HR12	0.03	0.07%	21.5	53.8%

6.3.2 Impact on Critical Levels and Loads

The annual mean NO_x impacts are presented in Table 6-20.

At ER1 to ER5, the PCs are <1% and therefore insignificant. Impacts are considered to cause 'no likely significant effects' to ER1, ER2, ER3 and ER4, and 'no likely damage' to ER5.

The PC is <100% at ER6 to ER11 and therefore considered to cause 'no significant pollution'.

Table 6-20: Commissioning (Cumulative) – Annual Mean NO_x Critical Level

ID	Designation	NO_x PC	PC as % of AQAL	NO_x PEC (µg/m^3)	PEC as % of AQAL
ER1	SPA / Ramsar	0.18	0.6%	12.7	42.3%
ER2	SAC	0.18	0.6%	12.7	42.3%
ER3	SAC	0.01	0.0%	8.5	28.4%
ER4	SAC	0.02	0.1%	15.3	51.1%
ER5	SSSI / SNCI	0.18	0.6%	12.7	42.3%
ER6	SNCI	0.04	0.1%	13.6	45.5%
ER7	SNCI	0.09	0.3%	13.0	43.4%
ER8	SNCI	0.05	0.2%	13.6	45.5%
ER9	SNCI	0.31	1.0%	16.2	54.1%
ER10	SNCI	0.07	0.2%	13.0	43.3%
ER11	SNCI	0.09	0.3%	12.7	42.4%

Based on the annual mean NO_x CLe impacts, the impacts on the nitrogen and acid CLo are 'insignificant' across all the designated ecological sites.

7.0 Conclusions

The assessment has considered potential impacts on air quality from the Site SBGs as a result of routine testing and maintenance operations, non-routine emergency outage operation, and commissioning.

The key findings are summarised in the following sections.

Routine Testing and Maintenance Schedule:

- Annual mean NO_2 impacts associated with the proposed routine testing and maintenance schedule are predicted to be insignificant at all the modelled human receptor locations.
- There are no predicted exceedances of the 1-hour mean NO_2 AQAL at the modelled human receptor locations.
- There are no predicted exceedances of the 1-hour mean and 10-minute NO_2 AEGLs at the modelled human receptor locations.
- There are no predicted exceedances of the 1-hour mean NO EAL at the modelled human receptor locations.
- Impacts on designated ecological sites are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, ‘no likely damage’ to ER5, and ‘no significant pollution’ to ER6 to ER11.

Emergency Outage (72 Hours):

- Annual mean NO_2 impacts associated with a hypothetical 72-hour emergency outage are predicted to be insignificant at all the modelled human receptor locations.
- The probability of exceedance of the 1-hour mean NO_2 AQAL at the modelled human receptor locations is ‘highly unlikely’.
- There are potential exceedances of the 1-hour mean (<5% probability) and 10-minute (>5% probability) NO_2 AEGLs at some of the modelled human receptor locations.
- There are no predicted exceedances of the 1-hour mean NO EAL at the modelled human receptor locations.
- Impacts on the annual mean CLe and CLo are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, ‘no likely damage’ to ER5, and ‘no significant pollution’ to ER6 to ER11.
- There are potential exceedances of the daily mean NO_x CLe at most of the designated ecological sites when assuming a >24-hour outage duration.

Commissioning (Cumulative with Testing and Maintenance)

- Given the duration/nature of the commissioning tests, the short-term impacts would be no greater than those predicted for the routine testing and maintenance schedule.
- Annual mean NO_2 impacts associated with the cumulative commissioning scenario are predicted to be insignificant at all the modelled human receptor locations.
- Impacts on designated ecological sites are considered to cause ‘no likely significant effects’ to ER1, ER2, ER3 and ER4, ‘no likely damage’ to ER5, and ‘no significant pollution’ to ER6 to ER11.

Appendix A EA Modelling Checklist

Environmental Permit Application

Air Emissions Risk Assessment – Avonmouth Data Centre

Avonmouth Data Centre Limited

SLR Project No.: 416.066815.00001

22 April 2026

Table A-1: Modelling Checklist

Item	Yes/No	Details / Reason for Omission
Location map	Yes	Figure 3-4
Site plan	Yes	Figure 3-2
Pollutants modelled and relevant EALs	Yes	Table 2-1, Table 2-3
Details of modelled scenarios	Yes	Table 5-1
Details of relevant ambient concentrations	Yes	Section 4.0
Model description and justification	Yes	Section 3.1
Special model treatment used	Yes	Section 3.2.1
Table of emission parameters used	Yes	Table 5-2
Details of modelled domain and receptors	Yes	Section 3.1.2
Details of meteorological data used	Yes	Section 3.1.5
Details of terrain treatment	Yes	Section 3.1.3
Details of building treatment	Yes	Section 3.1.4
Details of modelling deposition	Yes	Section 3.3
Model uncertainty and sensitivity	Yes	Section 3.1.1
Assessment of impacts	Yes	Section 6.0
Contour plots	Yes	Appendix B
Model input files	Yes	Appendix C

Appendix B Contour Plots

Environmental Permit Application

Air Emissions Risk Assessment – Avonmouth Data Centre

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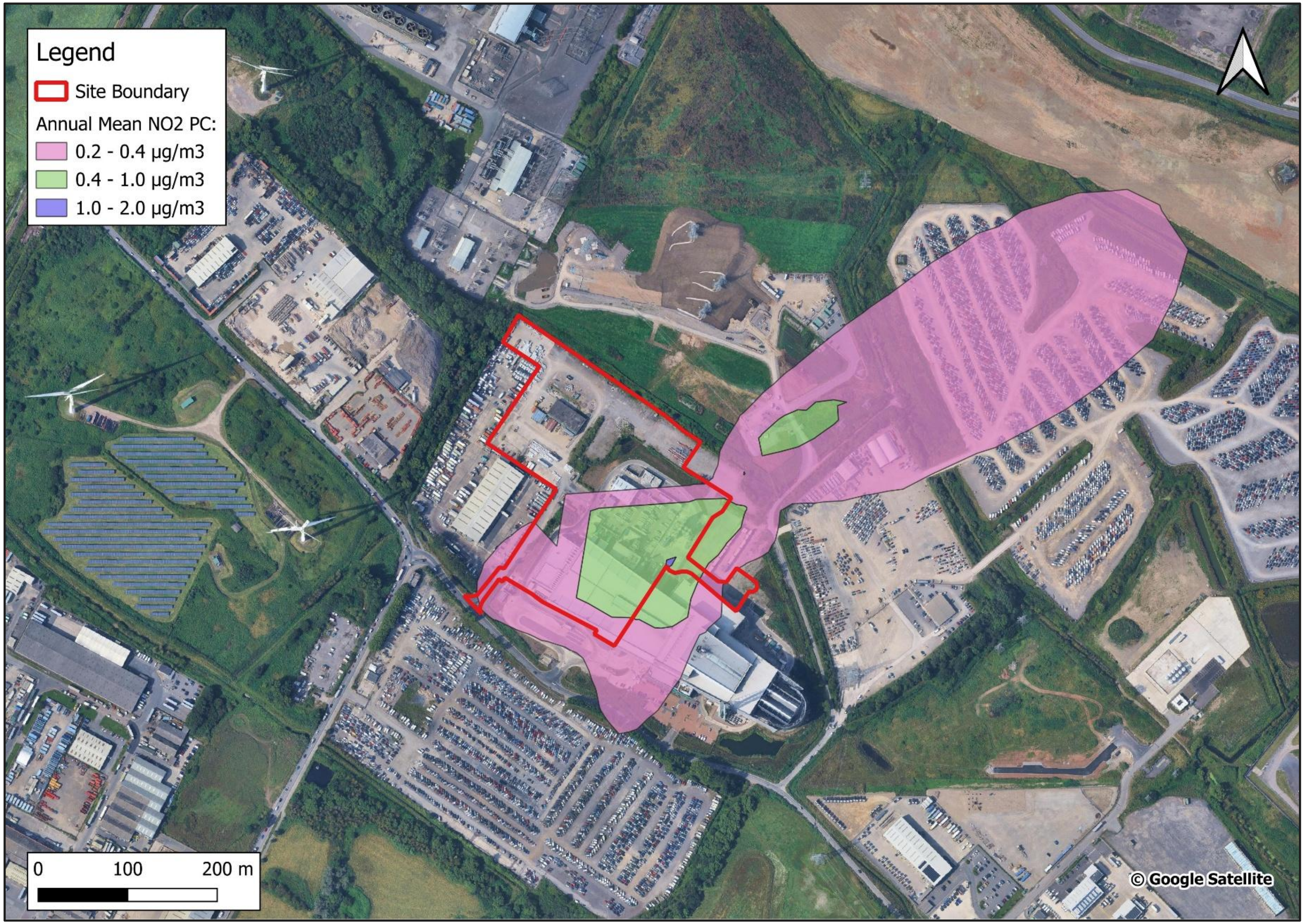

Figure B-1: Testing and Maintenance – Annual Mean NO_2 PC

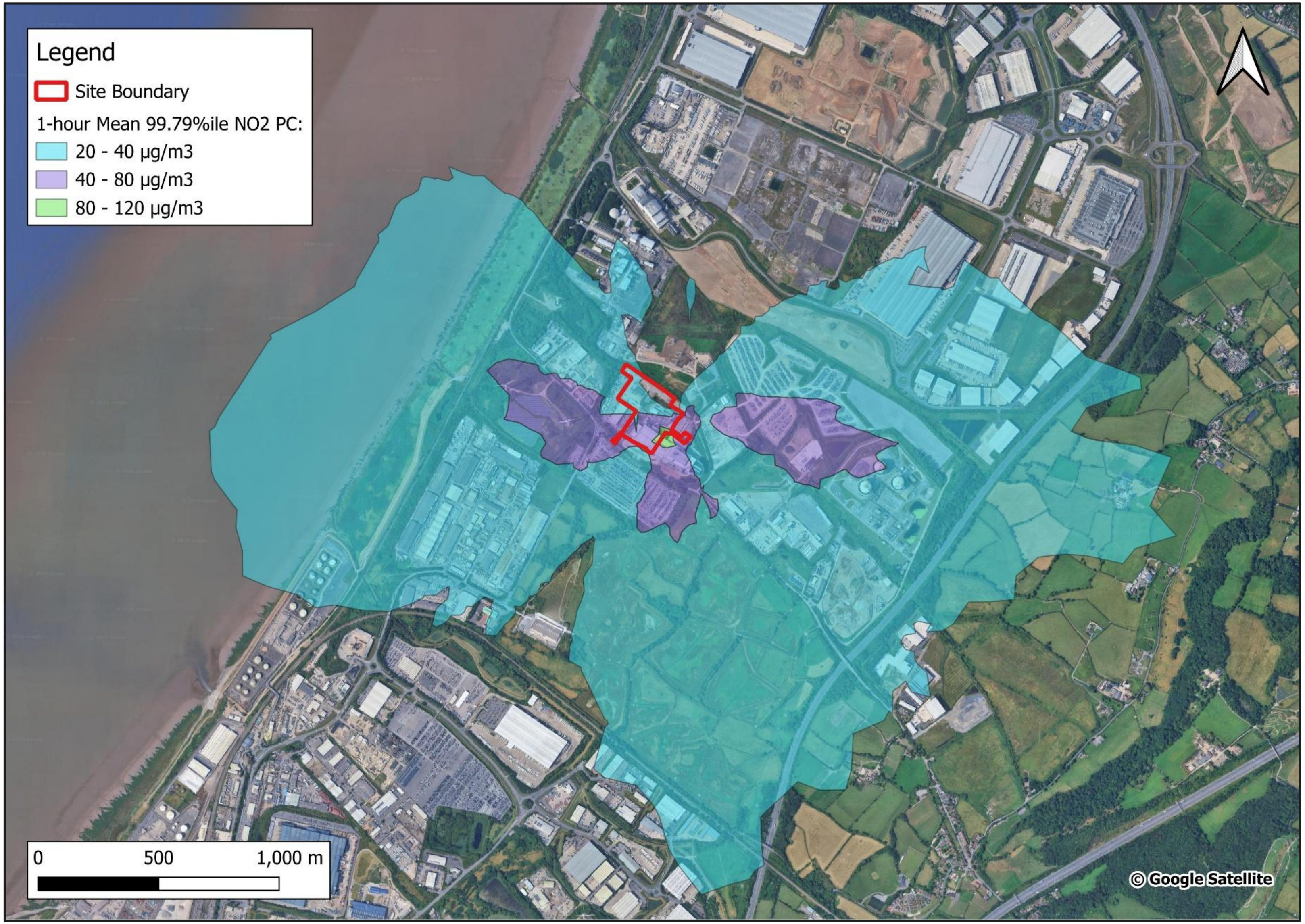

Figure B-2: Testing and Maintenance – 1-hour Mean (99.79%ile) NO_2 PC

Appendix C Model Files (electronic only)

Environmental Permit Application

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