AtkinsRéalis

Air Quality Assessment

EHS International Ltd for Yondr

October 2025

100122494

LON1X2 DATA CENTRE, SLOUGH

Notice

This document and its contents have been prepared and are intended solely as information for EHS International Ltd for Yondr and use in relation to the LON1X2 data centre at the Former Akzonobel Decorative Paints, Wexham Road, Slough, SL2 5DS.

AtkinsRéalis Ireland Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 57 pages including the cover.

Document history

Document title: Air Quality Assessment

Document reference: 100122494

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Draft for client comment	OR	DF	ME	SH	30/10/25

Client signoff

Client	EHS International Ltd for Yondr
Project	LON1X2 DATA CENTRE, SLOUGH
Job number	100122494
Client signature/date	

Contents

Tables

Figures

1. Overview

1.1 Introduction

EHS International Ltd, on behalf of Yondr Group, commissioned AtkinsRéalis Ireland Limited (AtkinsRéalis) to undertake an air quality assessment for the LON1X2 data centre facility, referred to as 'Building C'. The LON1X2 facility represents the second phase (Phase 2) of the wider mixed-use development located at the former AkzoNobel site in Slough.

This report describes an atmospheric dispersion modelling study of combustion emissions undertaken to evaluate the impact on human health and ecological receptors, of the operation of the standby diesel generator engines during testing and in an emergency power outage.

1.2 Background

Outline planning permission for the development area (reference P/00072/096) was granted on 19th November 2020 for a mixed-use development on land at the former AkzoNobel Decorative Paints facility, Wexham Road, Slough SL2 5DB. This permission was granted by Slough Borough Council (SBC) subject to multiple conditions, including Condition 17, which requires an air quality assessment associated with the data centre end use:

Condition 17 stated:

> *"Should a Reserved Matters application be made for data centre use on all or any part of the commercial land, an Air Quality Assessment demonstrating that ambient concentrations of applicable pollutants during the operation of the proposed facility(ies) would not result in significant impact at relevant sensitive receptors shall be submitted and approved by the Local Authority alongside the first Reserved Matters application.*
>
> *Reason: To protect sensitive receptors from pollution in accordance with Policy 8 of the adopted Core Strategy 2006–2026 and the National Planning Policy Framework (2019)."*

To discharge Condition 17, a Reserved Matters application (reference P/00072/137) was submitted for Phase 1 (LON1X0, Buildings A and B), including an air quality assessment hereafter referred to as the 'Phase 1 report'[1].. This was approved by SBC in October 2021. Notably, the air quality assessment also considered emissions associated with Phase 2 (LON1X2, Building C) based on outline design information. Subsequent consultation between the Applicant and SBC Environmental Services division in 2024 provided the following confirmation that Condition 17 could be discharged:

> *"Air quality – Following the receipt of additional information, the conclusions of the Air Quality Assessment submitted pursuant to Condition 17 are acceptable and the condition can be discharged. The EA will also be reviewing this assessment and will not grant a permit if they find any issues with the Assessment. The proposed development will not significantly or adversely impact local amenity. A compliance condition is recommended, however, in relation to generator testing to ensure that only one generator is tested at any one time across the campus. This has been included as Condition 2 in the recommendation."*

[1] SWECO (2021) Air Quality Assessment: 66202273-SWE-ZZ-XX-YA-RP-0003

Condition 2 states:

> *"Air quality – Generator testing for the normal operation of the proposed scheme, only one generator shall be tested on-load at any one time. This shall be coordinated across all three data centres (Building A, Building B and Building C) to ensure that only one generator is tested at any one time across the site.*
>
> *REASON: To protect sensitive receptors from pollution in accordance with Policy 8 of the adopted Core Strategy 2006 - 2026 and the National Planning Policy Framework (2023)."*

The LON1X0 facility comprises 52 standby generator sets (26 per building) to provide backup power. The proposed LON1X2 facility, which is the subject of this air quality assessment, is a new and separate data centre. It will require the installation of an additional 32 standby generators (Rolls Royce DS3300 units), arranged consecutively in two sets of 16. As with the LON1X0 facility, these generators provide emergency backup power to ensure critical systems remain operational during a power outage. The generators will require periodic testing to ensure performance and availability in the event of an unplanned or emergency power loss. There are two routine test regimes for the standby generators:

- Monthly testing at no load for approximately 15 minutes per generator; and
- Biannual on-load testing for a maximum of 6 hours per event (total 12 hours per year).

1.3 Approach

In line with consultation comments provided by SBC Environmental Services, an air quality assessment will be required to support the Environmental Permit application for the LON1X2 facility and will be submitted to the Environment Agency (EA) for review. The air quality assessment for the LON1X2 facility has therefore been undertaken with reference to Environment Agency online guidance, 'Air Emissions Risk Assessment for your Environmental Permit'[2] and 'Environmental Permitting: Air Dispersion Modelling Reports'[3], in accordance with accepted good practice. Cumulative impacts from the adjacent permitted LON1X0 facility are considered.

The approach reflects the methodology and model inputs from the Phase 1 report, which was accepted for planning, and has been updated to reflect:
the latest design parameters for the proposed LON1X2 facility and existing facilities;

- the latest measured and modelled air quality concentrations in the study area;
- local constraints, such as any new sensitive developments;
- worst-case human health and ecological receptor locations and elevations;
- the latest dispersion modelling software version (AERMOD v24142); and
- five recent years of hourly meteorological data from Heathrow Airport meteorological station.

The assessment of construction-phase dust and operational-phase traffic was accepted at the outline planning stage (reference: P/00072/096). Construction dust mitigation measures suitable for the site activities were recommended in the Phase 1 report, which also confirmed that road-based contributions from development traffic are insignificant (modelled concentrations were less than 1% of the relevant air quality criteria for all receptors and all pollutants of concern in this assessment).

There are no design aspects which would materially affect either the likely volume of construction dust or increase the level of operational-phase traffic therefore the Phase 1 report remains a robust representation of the potential

---

[2] Defra (2025) 'Air emissions risk assessment for your environmental permit'. Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[3] Defra (2024) 'Environmental permitting: air dispersion modelling reports'. Available at: https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports

impacts from these sources. As such, both traffic emissions and construction dust are considered not to be a material concern and have been scoped out of this Phase 2 assessment.

This report for Phase 1 provides:

- a description of existing conditions and sensitive receptors;
- a summary of model input data including the flow rates and emission rates;
- a dispersion modelling study using meteorological data for a five-year period;
- an assessment of pollutant concentrations at human health and ecological receptors;
- a comparison of pollutant concentrations against air quality criteria;
- consideration of cumulative impacts during routine and emergency testing; and
- conclusions regarding the acceptability of the findings.

2. Assessment methodology

2.1 Baseline conditions

Information on existing baseline air quality conditions was obtained from the following sources:

- Information on local air quality including Air Quality Management Areas (AQMAs) and monitoring data from the latest SBC air quality annual status report[4] and Department for Environment, Food and Rural Affairs (Defra) AQMA mapping[5];
- background pollutant concentrations model data from Defra's Air Quality Information Resource (UK-AIR)[6];
- residential properties have been identified from OpenStreetMap[7];
- designated nature conservation sites have been identified from Multi-Agency Geographic Information for the Countryside (MAGIC) website[8]; and
- air pollution information for designated sites from the UK Air Pollution Information System (APIS)[9] website.

2.2 Study area

The study area for this air quality assessment lies within SBC and was defined in accordance with the Environment Agency's online guidance for air emissions risk assessment[2]. This includes ecological screening distances of 10 kilometres for internationally or European-designated sites, 2 kilometres for nationally designated sites, and 1 kilometre for non-statutory local sites. The 1-kilometre screening distance was also applied to identify the worst-case human health receptors and SBC air quality monitoring locations and was covered by an isopleth (contour) plot to illustrate the pattern of dispersion across the study area.

The study area is illustrated in Figure 2-1.

[4] SBC Air Quality Annual Status Report (2024). Available at: https://www.slough.gov.uk/downloads/file/4398/2024-air-quality-annual-status-report-asr-

[5] Defra AQMA interactive map. Available at: http://uk-air.DEFRA.gov.uk/aqma/maps

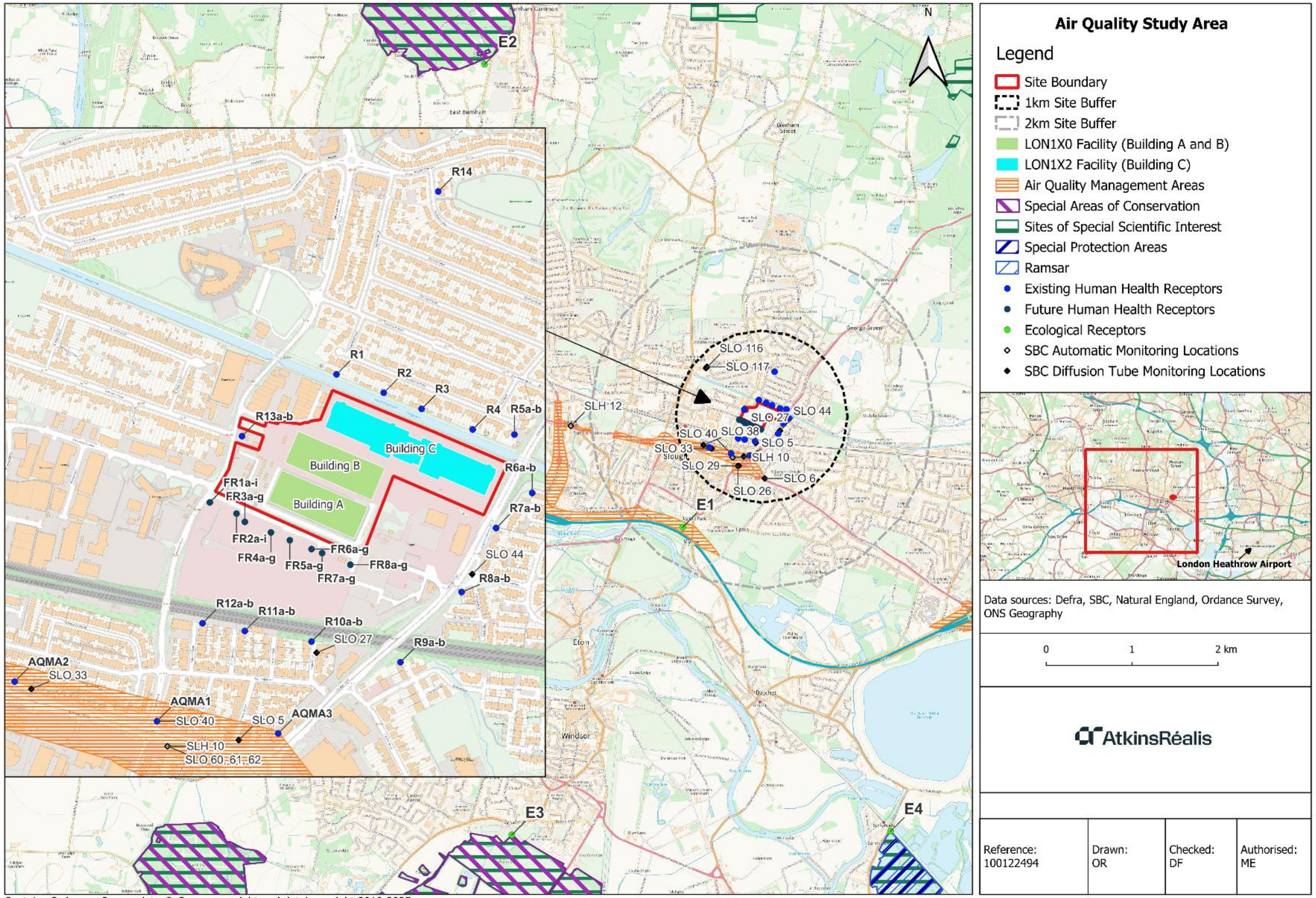
[6] Defra UK-AIR 'Modelled background pollution data'. Available at: https://uk-air.Defra.gov.uk/data/modelling-data

[7] OpenStreetMap. Available at: https://www.openstreetmap.org

[8] Defra Magic. Available at: https://magic.defra.gov.uk/

[9] UK Air Pollution Information System. Available at: https://www.apis.ac.uk/

Figure 2-1 - Air quality study area



Contains Ordnance Survey data © Crown copyright and database right 2010-2025.

2.3 Sensitive receptors

2.3.1 Human health

For the purposes of air quality assessment, sensitive human health receptors are those where members of the public will be frequently present and where more vulnerable receptors (e.g. residential/schools/care home etc).

For consistency, the discrete modelled human health receptors considered in this assessment were aligned with those assessed in the accepted Phase 1 report. Additional human health receptors were included in the model to represent a range of locations that are likely to be most affected by emissions from Phase 2. This included extended receptor coverage to the north, where short term generator impacts from Building C operation are likely to be highest due to prevailing winds and building influences. Discrete receptors within the Slough AQMA No.4 to the south have also been included.

Details of the selected representative sensitive human health receptors considered within this assessment are set out in Table 2-1.

Table 2-1 - Selected local human health receptors

ID	Location	Eastings, m	Northings, m	Height, m
R1	Hazlemere Road	498717	180472	1.5
R2	Hazlemere Road	498802	180439	1.5
R3	Hazlemere Road	498870	180410	1.5
R4	Hazlemere Road	498962	180373	1.5
R5a*-b	Hazlemere Road	499037	180364	1.5 and 4.5
R6a-b	Goodman Park	499069	180259	1.5 and 4.5
R7a-b	Goodman Park	499004	180196	1.5 and 4.5
R8a-b	Victoria Road	498942	180081	1.5 and 4.5
R9a-b	Denton Way	498832	179955	1.5 and 4.5
R10a-b	India Road	498672	179992	1.5 and 4.5
R11a-b	Australia Road	498552	180011	1.5 and 4.5
R12a-b	Colonial Road	498476	180025	1.5 and 4.5
R13a^-b	Wrexham Road	498547	180361	1.5 and 4.5
R14	Maple Crescent	498900	180800	1.5
AQMA1#	Wexham Road	498394	179849	1.5
AQMA2#	Apsley House	498138	179920	1.5
AQMA3#	Uxbridge Road	498612	179827	1.5

*Assessed as discrete receptor R2 in the Phase 1 report.

^Assessed as discrete receptor R19 in the Phase 1 report.

#Located in the Slough AQMA No. 4 and assessed as discrete receptors R4, R5 and R24 in the Phase 1 report.

The Phase 2 site forms part of a wider development area, which includes additional residential properties to the south of the LON1X0 and LON1X2 facilities. These properties have not yet been constructed and, in line with the

Phase 1 report methodology, have been considered within the assessment as future sensitive human health receptors.

The locations of the future sensitive human health receptors have been updated following the Phase 1 report and now consider multiple elevations, starting from 1.5 metres above local ground level to represent the breathing zone, and extending vertically at 3 metre increments to cover the full height of the proposed future residential buildings.

Details of the future sensitive human health receptors considered within this assessment are set out in Table 2-2.

Table 2-2 – Future local human health receptors

ID	Location	Eastings, m	Northings, m	Height, m
FR1a-i	Future Residential Block A	498489	180242	1.5, 4.5, 7.5, 10.5, 13.5, 16.5, 19.5, 22.5 and 25.5
FR2a-i		498537	180222	
FR3a-g	Future Residential Block B	498552	180207	1.5, 4.5, 7.5, 10.5, 13.5, 16.5 and 19.5
FR4a-g		498599	180188	
FR5a-g		498633	180174	
FR6a-g		498672	180158	
FR7a-g	Future Residential Block C	498691	180151	1.5, 4.5, 7.5, 10.5, 13.5, 16.5 and 19.5
FR8a-g		498742	180130	

2.3.2 Ecological receptors in designated habitats

Designated nature conservation sites may contain features that are sensitive to increased concentrations and deposition of airborne pollutants. Evaluation of the significance of the effect on designated habitats has been undertaken with consideration of the ecological receptors identified in the Phase 1 report, in addition to the following screening distances set out in the Environment Agency's online guidance for air emissions risk assessment2:

- Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites within 10 kilometres of the development area;
- Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs), within 2 kilometres of the development area; and
- Local Wildlife Sites (LWSs) and areas of Ancient Woodland (AW) within 1 kilometre of the development area.

Details of the ecological receptors considered within this air quality assessment are set out in full in Table 2-3. All ecological receptors were modelled at a height of 0 metres.

Table 2-3 – Ecological receptor locations

ID	Name	Designation	Eastings, m	Northings, m	Distance, km
E1	Herschel Park^	LNR	497830	178995	1.4
E2	Burnham Beeches^	SAC	495524	184373	4.9
E3	Windsor Forest & Great Park^	SAC	495842	175418	5.5
E4	Southwest London Waterbodies*	SPA/Ramsar	500249	175460	4.9

*Considered to be 'Grassland'.
^Considered to be 'Forest'.

2.4 Dispersion modelling

The atmospheric dispersion modelling was undertaken using the latest available version of the US EPA model AERMOD (24142), as incorporated by Trinity Consultants Inc. in the software BREEZE AERMOD. This model is the result of many years development by the US EPA and the American Meteorological Society. It has been developed as a regulatory model that incorporates the current understanding of atmospheric physical processes. This model is used by regulatory agencies, consultants and industry worldwide to assess the impact of air emissions from point, area, line, flare and volume sources.

AERMOD simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. The dispersion modelling system includes:

- an advanced meteorological pre-processor to compute site-specific planetary boundary layer parameters;
- highly developed dispersion formulations that incorporate current planetary boundary layer understanding and variables for both convective and stable boundary inversions;
- enhanced treatment of plume rise and plume penetration for elevated inversions, allowing for effects of strong updrafts and downdrafts that occur in unstable conditions; and
- improved computation of vertical profiles of wind, turbulence and temperature.

AERMOD includes two data pre-processors for streamlining data input: AERMET, a meteorological pre-processor, and AERMAP, a terrain pre-processor. The model can address both local topography and building downwash effects concurrently, where relevant to the study. The model provides reasonable estimates over a wide range of meteorological conditions and modelling scenarios. The building downwash algorithms in AERMOD PRIME, using parameters calculated by the Building Parameter Input Program (BPIP), distinguish this model from earlier versions of AERMOD, which used a simpler procedure to address downwash.

2.4.1 Source parameters

The stack emission parameters for the 32 diesel generators (Rolls Royce DS3300) associated with LON1X2 (Building C), and the sources of information, are set out in Table 2-4. The stack emission parameters for the LON1X0 facility (Buildings A and B) generators are set out in Table 2-5.

Due to permanent electrical infrastructure limitations, as confirmed by the operator, the LON1X2 generators will be de-rated to a power output of 2,200 kW. Where information was unavailable (e.g. actual flow rate, exit temperature and NO_x emission rate) for the derated generators, stack emission parameters were sourced from the Phase 1 report. The PM_{10} emission rate was taken from measurements provided in the generator datasheet for the 20V4000G34F 6ETC (DS3300) engine model.

All stack emission parameters for the LON1X0 generators were sourced from the Phase 1 report, except for the PM_{10} emission rate. The PM_{10} emission rate was again sourced from the generator datasheet for the 20V4000G34F 6ETC engine model.

Table 2-4 – Stack emission parameters for the LON1X2 facility (Building C) generators

Parameter	Unit	Value	Source
Number of units	-	32	Layout plans (document ID: LON1X2-RKD-CZ-ZZ-DR-A-00002.pdf)
Stack diameter (internal)	m	0.55	Layout plans (document ID: LON1X2-AVK-CZ-XX-DR-E-3002 - Exhaust Flue APM.pdf)
Stack height (above ground level)	m	15.95	Provided by client
Generator power (Derated)	KWe	2,200	Derated from 2,400 kWe. Phase 1 report and engineering limitation discussions
Actual flow rate	Am^3/s	8.07	Phase 1 report
Exit velocity	m/s	33.97	Phase 1 report and layout plans (document ID: LON1X2-AVK-CZ-XX-DR-E-3002 - Exhaust Flue APM.pdf)
Exit temperature	K	750.80	Phase 1 report
NO_x emission rate	g/s	2.25	
PM_{10} emission rate	g/s	0.043	Calculated from generator specification sheet (document ID: Rolls Royce Generators LON1X2.pdf)

Table 2-5 – Stack emission parameters for the LON1X0 facility (Buildings A and B) generators

Parameter	Unit	Value	Source
Number of units per building	-	26	Phase 1 report
Stack diameter (internal)	m	0.55	
Stack height (above ground level)	m	21.95	
Generator power (100% load)	KWe	2,400	
Actual flow rate	Am^3/s	10.30	
Exit velocity	m/s	44.00	
Exit temperature	K	789.15	
NO_x emission rate	g/s	2.22	
PM_{10} emission rate	g/s	0.047	Calculated from generator specification sheet (document ID: Rolls Royce Generators LON1X2.pdf and Extracted LON1X0 Generator Datasheet.pdf)

2.4.2 Model scenarios

Two core model scenarios have been assessed, which each consider the emissions from the 32 generators associated with Building C (LON1X2) in combination with emissions from the 26 generators associated with Buildings A and B (LON1X0). The modelled scenarios are:

1. '**Most-likely' testing scenario**: monthly testing at no load for approximately 15 minutes per generator, and biannual on-load testing for a maximum of 6 hours per event (a total runtime of 12 hours per generator per year). The emissions were conservatively modelled, assuming that:
   a. testing of any individual engine could last up to an hour, at any time of the year giving a total runtime of 24 hours per generator per year, nearly twice the anticipated usage.

   The 'Most-likely' testing scenario was set up to run every generator in all hours of the year, both individually and in combination. The results were factored to represent 24 hours of operation of each generator per year (6 x 2 hours load testing, 12 x 1-hour monthly testing).

   The approach to modelling the maximum short-term impact for the 'Most-likely' testing scenario reflects Planning Condition 2 (see section 1.2) wherein no engine may be tested concurrently.
2. **'Worst case' emergency scenario**: an emergency power outage event, which is inherently unpredictable in terms of the timing, magnitude and duration of the occurrence. The emissions were conservatively modelled, assuming that:
   a. generators from Buildings A, B and C would run on-load with emissions at the maximum permitted limit;
   b. there could be 4-hour, 12-hour, or 72-hour outages, all involving continuous operation of all generators at maximum power output.
   c. To estimate the maximum annual mean contribution, the results from the emergency scenario were combined with those for the 'most-likely' testing scenario

   Of these worst-case scenarios, the 4-hour event is considered a 'reasonable worst case', based on regional estimates[10] suggesting such power outage events may occur approximately once every 23 years and not for longer than 4 hours.

For each scenario, estimates were made of the short- and long-term process contributions (i.e. the hourly/daily and annual average ground level concentrations at receptors) and where appropriate, the total concentration including baseline. More information on post-processing of model outputs is provided in section 2.6.

2.4.3 Receptors

Pollutant concentrations were modelled at discrete receptors (see section 2.3) and using nested Cartesian receptor grids covering the local area. A 50 metre resolution grid over an area 2 by 2 kilometres wide centred on the development area was used in combination with a smaller, localised 750 metre wide grid set at 25 metre resolution. The higher resolution grid improves the spatial resolution of the model results in those areas subject to the highest concentration gradients close to the site boundary.

All gridded and discrete receptors were specified at a height of 1.5 metres above local ground elevation to represent the average human breathing zone height. Some discrete receptors were additionally modelled at 3 metre increments above local ground elevation to represent multi-storey residential properties.

[10]The Office of Gas and Electricity Markets (Ofgem). *Frequency Risk and Control Report 2025 Consultation.*

2.4.4 Terrain

Terrain elevations were not included in the dispersion model, either for receptors or structures. This is appropriate due to the limited variation in elevation across the air quality study area. This approach aligns with the Phase 1 methodology.

2.4.5 Meteorological data

The most appropriate meteorological station with adequate records in the format required for the dispersion modelling study is the Heathrow Airport meteorological station. This station is located approximately 7.3 kilometres to the east of the LON1X2 facility. Hourly sequential meteorological data for the five-year period 2020 to 2024 (covering the most recent five years of available data) were used in the dispersion model. The general topography of the area is such that records from Heathrow Airport are suitably representative of conditions in Slough in the vicinity of the LON1X2 facility. Furthermore, the meteorological station and the facility are at comparable elevations above sea level.

Each meteorological data file contains over 43,000 hourly records and, in accordance with best practice, is considered adequate to characterise local meteorology in terms of both extreme events and long-term average conditions.

In accordance with the US EPA guidance, the near-field land use within a one kilometre radius of the site was evaluated to determine the surface roughness length[11]. Land uses were specified by directional sector. A determination of the percentages of each type of land use was made based on inspection of Ordnance Survey mapping and aerial photography. The Bowen ratio[12] and albedo[13] were determined by the land use categories within the far-field, represented by a 10 x 10 km square centred on the site. A determination of the percentages of each type of land use was made based on inspection of Ordnance Survey mapping and aerial photography. The land use proportions are simply averaged over the area and are independent of distance or direction from the site: water (fresh and sea) 3%, deciduous forest 9%, urban 41% and cultivated land 47%.

Land use categories and sectors were entered in the AERMET software programme to generate site surface characteristics for use in the model. The model parameters (AERMOD recommended values) used to represent the area around the site are shown in Table 2-6.

Table 2-6 - Site surface characteristics

Sector	Degrees	Albedo	Bowen Ratio	Surface Roughness, m
Urban	0 - 360	0.240	1.111	1.0

The processed meteorological data were used to generate five individual annual meteorological data files for use in this assessment. Frequency distribution of wind speed and direction for each year is presented in Figure 2-2. It is evident from the figures that there is a primary prevailing wind from the south to west and adjoining sectors; there is a secondary prevailing wind from the north east.

[11] Surface roughness length is a measure of the height of obstacles to wind flow. It is not equal to the physical dimensions of obstacles but is generally proportional to them.

[12] The Bowen ratio is a measure of the amount of moisture at the earth's surface. This influences other parameters which in turn affect atmospheric turbulence.

[13] Noon-time albedo is the fraction of incoming solar radiation reflected from the ground when the sun is directly overhead. Adjustments are made in AERMET to incorporate the variation in the albedo with solar elevation angle.

Figure 2-2 - Heathrow Airport wind roses, 2020-2024

2.4.6 Building downwash

Buildings close to point source plume discharges that are more than 40% of the stack height may potentially cause downwash effects. The BPIP programme within AERMOD was used to calculate for each wind sector the direction specific building downwash parameters for each stack. The BPIP programme determines which structures are significant for each of the 360-degree wind directions and modifies the AERMOD input files with the appropriate parameters. For each stack on all buildings, there is an acoustic barrier which has been modelled as a single ancillary structure on each building which sits atop the roofline of the main buildings in the model.

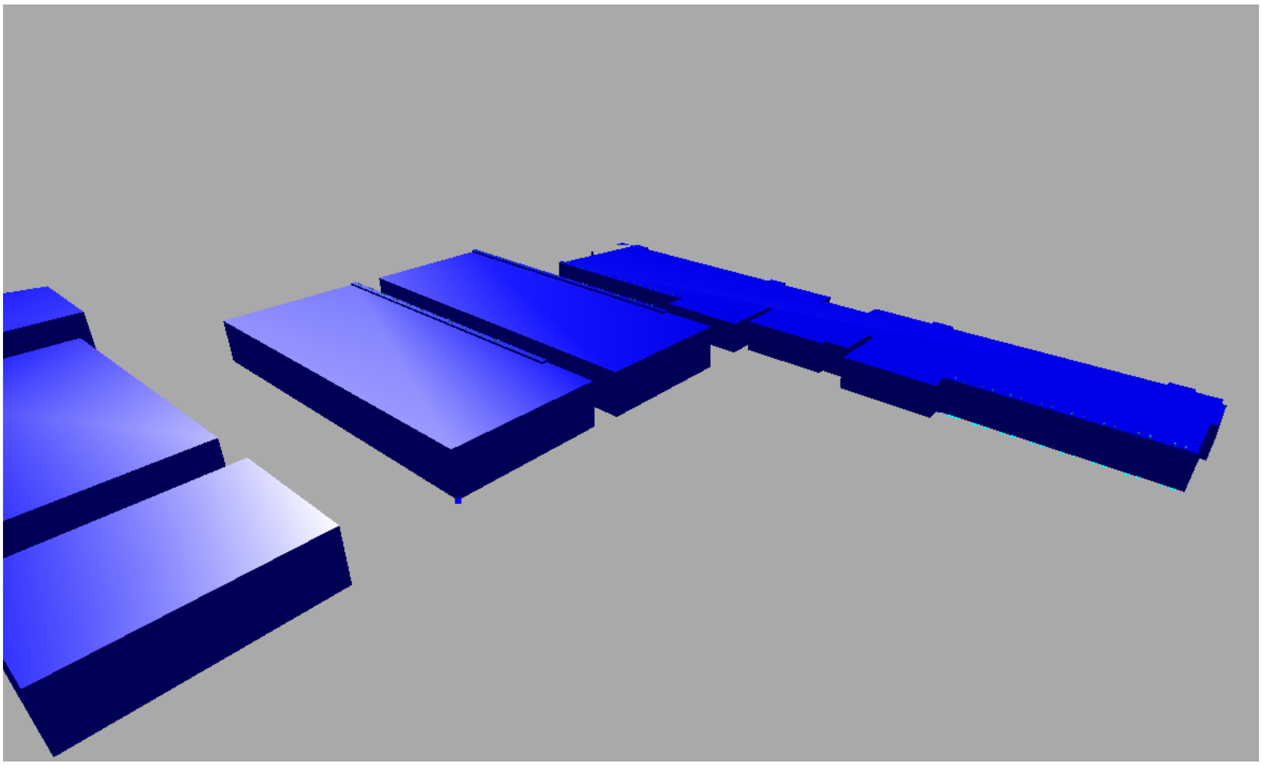
The detailed dimensions for the modelled buildings are provided in Table 2-7. The main structure included in the dispersion model is shown as a schematic in

Figure 2-3 , viewed from the south, with future residential structures to the left of the image.

Table 2-7 -Building input data

Name	Height, m	X Length, m	Y Length, m	Source
Building A	19.95	61.0	170.0	Phase 1 report
Building A ancillary structure	20.95	2.5	144.0	Layout plans (document ID: LON1X0-AVK-AZ-XX-DR-E-3002[Exhaust Flue Layout] Bld A Flue Stack.pdf)
Building B	19.95	65.0	170.0	Phase 1 report
Building B ancillary structure	20.95	2.5	144.0	Layout plans (document ID: LON1X1-AVK-BZ-XX-DR-E-3002 Bld B Gen Stack.pdf)
Building C	14.50	62.8	317.2	Layout plans (document IDs: LON1X2-AVK-CZ-XX-DR-E-3002 - Exhaust Flue APM.pdf and LON1X2-RKD-CZ-ZZ-DR-A-00002.pdf)
Building C ancillary structure	15.25	2.5	88.0	Layout plans (document ID: LON1X2-AVK-XX-XX-TS-E-0011 Rev P01.pdf)
Future Residential Block A	25.50	130.3	60.0	Phase 1 report, updated to reflect latest layout plans (planning document ID: P72-96.pdf, P/00072/096)
Future Residential Block B	21.00	68.9	130.3	
Future Residential Block C	21.00	73.7	54.9	
Future Residential Block D	21.00	26.5	92.8	
Future Residential Block E	21.00	26.5	57.5	
Future Residential Block F	21.00	26.0	57.5	
Future Residential Block G	28.50	26.5	22.5	

Figure 2-3 Schematic view of LON1X0 and LON1X2 with future residential buildings



2.4.7 Model uncertainty

Any atmospheric dispersion modelling exercise has inherent areas of uncertainty, including:

- input data (e.g. daily and seasonable variability in process emissions, source dimensions and stack parameters);
- simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere and the influence of structures on dispersion; and
- meteorological data, as no one year will be the same.

Uncertainty associated with the atmospheric dispersion modelling of emissions from the LON1X0 and LON1X2 facilities have been minimised by using:

- algorithms and relationships within a recognised dispersion model (AERMOD) that has been independently validated and judged as fit for purpose;
- a recent version of AERMOD (v12, Executable 24142) and AERMET (v10, Executable 24142) incorporating the latest bug fixes and algorithms;
- hourly sequential meteorological data provided by an approved supplier and which has been subject to robust quality checks; and
- conservative assumptions regarding the operational emissions e.g. assume a full hour of testing not 15 minutes; assuming testing could occur at any time of the year to coincide with the worst meteorological conditions; testing and emergency running at load with higher emissions that are likely at reduced or no load.

The approach taken for this assessment is considered sufficiently robust and in line with good practice.

2.5 Comparison with air quality criteria

In line with the Environment Agency's online guidance for air emissions risk assessment[2], to assess the potential impact on air quality, the modelled process contribution (PC) is compared to the relevant environmental standards (air quality criteria).

The results of the dispersion modelling have been presented as:
- tabulated PCs at selected discrete receptor locations to facilitate the discussion of maximum results; and
- concentration isopleths (contour plots) to illustrate the distribution of PCs across the wider study area.

In accordance with the Environment Agency's online guidance for air dispersion modelling reports[3], a PC is considered *insignificant* where it is less than:
- 10% of a short-term environmental standard; or
- 1% of a long-term environmental standard.

The guidance states that "*at the detailed modelling stage there are no criteria to decide whether PCs are significant*". For PCs that are not considered insignificant, the Predicted Environmental Concentration (PEC = PC + existing pollutant concentration) has been calculated to allow comparison to the relevant air quality criterion (standards and objectives) for both short-term and long-term exposure.

To estimate the long-term PEC, the PC is combined with the long-term baseline concentration; for the short-term PEC the PC is combined with twice the long-term baseline concentration. Air quality monitoring data from the latest SBC 2024 Annual Status Report were used to identify appropriate baseline concentrations for different receptor locations. These are shown in the results tables.

2.5.1.1 Human health

The Air Quality Strategy (AQS)[14] objectives/standards, for the pollutants of concern in this assessment (NO_2, PM_{10} and $PM_{2.5}$) are shown in Table 2-8.

Table 2-8 – NO_2, PM_{10} and $PM_{2.5}$ AQS objectives/standards (µg/m^3)

Pollutant	Short-term	Long-term
NO_2	200* (1h)	40 (1y)
PM_{10}	50^ (24h)	40 (1y)
$PM_{2.5}$	-	20 (1y)

*Not to be exceeded more than 18 times a year.
^Not to be exceeded more than 35 days a year.

Non statutory criteria, such as the Defra Daily Air Quality Index (DAQI) and the United States Environmental Protection Agency (US EPA) Acute Exposure Guideline Levels (AEGLs), are useful in evaluating short-term elevated concentrations such as those which may arise during a full emergency power outage.

[14] Defra (2023), The Air Quality Strategy for England: Framework for Local Authority Delivery. Available at: https://www.gov.uk/government/publications/the-air-quality-strategy-for-england

The DAQI[15] for nitrogen dioxide is based on the hourly mean concentrations shown in Table 2-9. Note that the primary purpose is to generate a daily, regional index for multiple pollutant exposure to ambient air, rather than occasional, very localised areas of impact from individual combustion sources.

Table 2-9- DAQI categories for hourly nitrogen dioxide concentrations

Index	1	2	3	4	5	6	7	8	9	10
Band	Low	Low	Low	Mod-erate	Mod-erate	Mod-erate	High	High	High	Very High
µg/m³	0-67	68-134	135-200	201-267	268-334	335-400	401-467	468-534	535-600	>600

For nitrogen dioxide, the US EPA acute exposure guideline level[16] AEGL-1 threshold of 0.5 ppm (approximately 940 µg/m^3) is the concentration above which the general population, including susceptible individuals, could experience discomfort, irritation, or certain asymptomatic non-sensory effects over short exposures up to eight hours. These are considered transient effects and reversible upon cessation of exposure (non-disabling). The AEGL-2 level of 12 ppm (23,000 µg/m^3) over one hour or 8 ppm (13,000 µg/m^3) over four hours, is a concentration that could lead to irreversible or other serious, long-lasting adverse (disabling) effects.

2.5.1.2 Ecological sites

The EU (Withdrawal Agreement) Act 2020 implements the air quality limit values that are included in the EU Directive and sets a critical level for annual mean concentrations of nitrogen oxides (NO_x) to protect sensitive vegetation. This objective does not apply in those areas where assessment of compliance with the limit value is not required. UK statutory nature conservation agencies' (Natural England) policy is to apply the criteria set out in Table 2-10, on a precautionary basis as a benchmark only, in all designated conservation sites.

Table 2-10 - NO_x air quality criteria (µg/m^3)

Pollutant	Short-term	Long-term
NO_x	75 (24h)*	30 (1y)

*A conservative choice, compared to using the higher value of 200 µg/m^3 for low pollution areas.

Oxides of nitrogen can contribute to nitrogen and acid deposition which can affect certain sensitive species and habitats within ecological sites. Dry nitrogen and acid deposition rates were calculated from NO_x (assuming 100% conversion to NO_2) using IAQM guidance[17] deposition velocities for woodland and grassland vegetation. These are used for assessment against the relevant critical loads for sensitive habitats identified within designated ecological sites, where available on APIS. Ranges for critical loads rather than fixed values are provided to allow for natural variation, uncertainties about deposition values and temporal variability of available data. Typically, the lower value in the range is used for a conservative assessment.

[15] Defra. 'What is the Daily Air Quality Index?' Available at: https://uk-air.defra.gov.uk/air-pollution/daqi?view=more-info&pollutant=no2#pollutant

[16] https://www.epa.gov/aegl/nitrogen-dioxide-aegl-program,

[17] IAQM (2020) 'A guide to the assessment of air quality impacts on designated nature conservation sites' v.1.1 Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

2.6 Post processing

2.6.1 Long-term average concentrations

2.6.1.1 'Most-likely' testing scenario

To estimate the annual mean contribution from engine testing, all engines were modelled to run concurrently at full load in every hour in the meteorological dataset. The results were then processed to extract the maximum NO_2 and PM_{10} (as well as $PM_{2.5}$) annual mean process contributions (PCs) from each of the five years at each receptor.

In line with EA guidance for permitting, a factor representing the expected number of operating hours per engine as a proportion of all hours in a year i.e. (24/8760) was applied to the maximum annual mean PCs for the testing scenario. The total of 24 operational hours is based on monthly no-load testing assuming one full hour per test, and biannual on-load testing of up to 6 hours per test.

For comparison with the long-term AQS objective for NO_2, the modelled oxides of nitrogen (NO_x) concentrations were multiplied by a factor of 0.7, in line with the Environment Agency's online guidance for air emissions risk assessment[2] recommendation for estimating long-term NO_2 PCs.

Although not modelled explicitly, $PM_{2.5}$ can be conservatively assumed to be the same as PM_{10}.

2.6.1.2 'Emergency' scenario

To estimate the annual mean contribution from emergency running, all engines were modelled to run concurrently at full load in every hour in the meteorological dataset. The results were then processed to extract the maximum NO_2 and PM_{10} (as well as $PM_{2.5}$) annual mean PCs from each of the five years at each receptor.

In line with EA guidance for permitting, a factor representing the total number of operating hours per engine as a proportion of all hours in a year i.e. (28/8760) was applied to the maximum annual mean PCs for the testing scenario. The total of 28 operational hours is based on monthly no-load testing assuming one full hour per test, and biannual on-load testing of up to 6 hours per test plus four hours of emergency outage. Additional factors were applied for a 12 hour and 72 hour outage.

For comparison with the long-term AQS objective for NO_2, the modelled NO_x concentrations were multiplied by a factor of 0.7, in line with the Environment Agency's online guidance for air emissions risk assessment[2] recommendation for estimating long-term NO_2 PCs.

2.6.2 Short-term average concentrations

2.6.2.1 'Most-likely' testing scenario

To determine the highest 1-hour average NO_2 PC at each receptor in the 'most likely' testing scenario, a source group apportionment model run was carried out. This provided individual results for each of the 84 generators for each year that was modelled. As AERMOD was run with a five-year data file, over 43,000 hours were processed. For each source group, the highest (100^{th} percentile) concentration at each receptor was identified. This is a deliberately conservative approach as it assumes that, for each receptor, the specific generator (out of the 84) that causes the greatest impact is running at full capacity for one hour during the worst possible weather conditions for pollutant dispersion, chosen from more than 43,000 hours of data in five years. In reality, any single engine is likely to operate for just 12 hours per year, making this scenario an extremely conservative result that combines testing with the worst of the 8,760 hours in a year.

To identify the maximum 24-hour mean PC for both NO_x and PM_{10} at each of the receptors, again a source group apportionment run was undertaken. This is considered a conservative approach, as it assumes the unlikely event of the individual generator, which gives the highest result at a receptor, aligning with the least favourable conditions for dispersion over a 24 hour period. A factor was applied to the maximum modelled 24-hour mean PC to represent the six hours of biannual on-load testing of engines in one 24 hour period for the 'most-likely' testing scenario.

For comparison with the short-term AQS objective for NO_2, the modelled oxides of nitrogen concentrations were multiplied by a factor of 0.35, in line with the Environment Agency's online guidance for air emissions risk assessment[2] recommendation for short-term process contributions.

2.6.2.2 'Emergency' scenario

To determine the highest 1-hour average NO_2 PC at each receptor in an emergency scenario, all 84 generators were modelled to operate concurrently in all hours throughout the year. As AERMOD was run with a five-year data file, over 43,000 hours were processed to identify the highest (100th percentile) concentration at each receptor.

The BREEZE post processing software 3DAnalyst was used to derive counts of exceedances of specified hourly average NO_2 concentrations thresholds, i.e. the short-term AQS standard of 200 µg/m^3 and the AEGL-1 threshold of 940 µg/m^3 for individual years. These were used in the hypergeometric mean calculation[18] which calculates the probability for likelihood of the short-term AQS objective or AEGL-1 threshold being exceeded.

To identify the maximum 24-hour mean PC at each of the receptors, a source group apportionment run was undertaken. Similar to the NO_2 hourly mean scenario described above, this is considered a conservative, risk-based approach, as it assumes the unlikely event of the generator which gives the highest result at a receptor aligning with the least favourable conditions for dispersion over a 24 hour period.

3. Baseline conditions

3.1 Local air quality management

All local authorities are required by Part IV of the Environment Act 1995 to review air quality and to assess both present and likely future air quality against objectives set out in the UK government's AQS. Where a local authority finds, that one or more of the AQS objectives is likely to be breached it must designate an Air Quality Management Area (AQMA) and develop an Action Plan to alleviate pollution levels.

It is noted that the Slough AQMAs[5] (No.1, No.3 extension and No.4) as well as the South Bucks District Council AQMA No. 2, all declared due to exceedances of the annual mean NO_2 AQS objective, are located within the modelled study area. The closest of which is the Slough AQMA No.4, situated within 345 metres of the development area.

3.2 Air quality monitoring

Air quality monitoring is undertaken by national and local authorities and is a key component of local air quality management. Measurements of pollutant concentrations are made by analytical instruments that measure

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

continuously, or simpler passive sampling devices such as diffusion tubes. The most recent monitoring data for Slough is from 2023, as reported in the SBC 2024 Annual Status Report[4].

The locations of the air quality monitoring sites located within the air quality study area is shown on Figure 2-1.

3.2.1 Continuous monitoring data (CMS)

SBC undertook automatic monitoring at 12 sites during 2023. The closest of these is the Slough Town Centre, Wellington Street (SLH 10), a roadside site located 455 metres to the south of the development area which monitored NO_x and NO_2 concentrations. The results in Table 3-1 indicate that annual mean NO_2 concentrations between 2019 and 2023 were consistently below the long-term AQS objective for NO_2 at both the SLH 10 and SLH12 CMS.

Table 3-1 – Monitored CMS annual mean NO_2 concentrations (µg/m^3)

Site ID	Site type	X	Y	2019	2020	2021	2022	2023
SLH 10	Roadside	498413	179804	34.7	24.6	27.3	28.3	25.1
SLH 12	Roadside	496528	180171	39.2	26.9	28.9	28.7	25.5

The closest SBC automatic monitoring site which monitors PM_{10} is the Slough Windmill, Bath Road roadside site (SLH 12), located 1.9 km to the west of the site, in the Slough AQMA No. 3 Extension. The results in Table 3-2 indicate that annual mean PM_{10} concentrations between 2019 and 2023 were consistently well below the long-term AQS objective for PM_{10} at SLH 12.

Table 3-2 – Monitored CMS annual mean PM_{10} concentrations (µg/m^3)

Site ID	Site type	X	Y	2019	2020	2021	2022	2023
SLH 12	Roadside	496528	180171	23.4	18.9	18.7	19.8	17.0

3.2.2 Passive monitoring data

SBC undertook non-automatic (i.e. passive) monitoring of NO_2 at 74 sites during 2023, 12 of which are within 1 kilometre of the development area. All sites are roadside monitoring locations, except for SLO 27, which is classified as 'other', and SLO 29, 60, 61, and 62, which are kerbside.

The location of the monitoring sites is shown on Figure 2-1. The monitoring results in Table 3-3 indicate that annual mean NO_2 concentrations were consistently below the long-term AQS objective for NO_2 at all 12 sites within the study area between 2019 and 2023, except for SLO 29 in 2019 and 2022.

Table 3-3 – Monitored SBC diffusion tube annual mean NO_2 concentrations (µg/m^3)

Site ID	Site type	X	Y	Distance to site (m)	2019	2020	2021	2022	2023
SLO 5*	Roadside	498541	179815	390	33.6	27.6	25.2	28.3	23.2
SLO 6	Roadside	498784	179560	585	27.8	21.2	21.2	23.8	-
SLO 26*	Roadside	498473	179706	515	31.8	20.3	19.0	19.6	19.6
SLO 27	Other	498681	179972	190	35.2	26.7	29.3	29.7	26.1

Site ID	Site type	X	Y	Distance to site (m)	2019	2020	2021	2022	2023
SLO 29*	Kerbside	498483	179707	515	**48.5**	33.8	39.0	44.2	34.6
SLO 33*	Roadside	498168	179907	485	30.1	23.1	20.0	24.2	-
SLO 38*	Roadside	498071	179949	530	33.0	25.0	22.4	22.4	18.1
SLO 40*	Roadside	498394	179849	415	37.9	29.7	29.6	32.6	29.1
SLO 44	Roadside	498961	180113	110	29.8	24.7	23.6	23.6	20.8
SLO 60, 61, 62*	Kerbside	498413	179804	455	33.6	24.9	26.8	29.5	25.8
SLO 116	Roadside	498103	180842	630	-	-	24.5	23.8	22.8
SLO 117	Roadside	498112	180857	635	-	-	21.5	24.5	20.1

Bold text denotes an exceedance of the NO_2 annual mean limit value.

*Located within the Slough AQMA No. 4.

3.2.3 Mapped background concentrations

Estimates of current and future year background pollutant concentrations in the UK are available on the Defra UK-AIR website[6]. These background estimates, which are a combination of measured and modelled data, are available for each one km grid square throughout the UK for a reference year of 2021, which is the basis for future year estimates up to 2050. These background estimates include contributions from all source sectors, e.g. road transport, industry and domestic and commercial heating systems.

Estimated annual mean background concentrations for the 1 km grid squares that include the LON1X2 facility and the study area for the operational phase for 2026 are presented below in Table 3-4 for the pollutants NO_x, NO_2, PM_{10} and $PM_{2.5}$. These data indicate that background concentrations of key pollutants are predicted to be well below relevant AQS objectives in 2026.

Table 3-4 – Defra background concentrations in 2026 (μg/m³) across the study area

Grid square (x, y) *	2026 background concentration (μg/m³)			
	NO_x	NO_2	PM_{10}	$PM_{2.5}$
Site boundary^	17.1	12.8	14.2	8.5
Minimum	11.5	8.9	11.3	7.0
Maximum	18.5	13.7	14.7	8.5

^Grid square where the LON1X2 site boundary is located (498500,180500).

*The following grid squares across the air quality study area have been considered: 495500, 178500; 495500, 184500; 495500, 187500; 496500, 179500; 496500, 180500; 497500, 178500; 497500, 179500; 497500, 180500; 497500, 181500; 498500, 178500; 498500, 179500; 498500, 180500; 498500, 184500; 499500, 180500; 500500, 183500; 501500, 180500.

For SAC designated sites, habitat types, key features, critical loads, and background nitrogen deposition rates were obtained from site-specific information available on the APIS website. For all other sites, parameters were derived from the average values for the relevant grid square on the APIS website. Critical loads were based on the habitat type suggested by the Magic Living Habitat Map[19] for that grid square.

The habitat types, key features, critical loads, and background nitrogen deposition rates are set out in Table 3-5.

Table 3-5 – Critical loads and background nitrogen deposition rates for nitrogen sensitive designated sites

Site name	Designation	Minimum nitrogen critical load (kg N/ha/yr)	Background nitrogen deposition rate (kg N/ha/yr)	Acidity critical load (keq/ha/yr)	Acid background (keq/ha/yr)
Herschel Park	LNR^	5	12.0	4.4	0.9
Burnham Beeches	SAC#	10	24.2	2.1	1.0
Windsor Forest & Great Park	SAC**	10	22.2	1.0	1.7
Southwest London Waterbodies	SPA/Ramsar^^	5	12.3	1.8	1.0

^Herschel Park suggested designated feature(s): Acid, Calcareous and Neutral Grassland.

#Burnham Beeches designated feature(s): Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion), Fagus Sylvatica - Deschampsia Flexuosa Woodland, Fagus Sylvatica - Rubus Fruticosus Woodland, Quercus Robur – Pteridium Aquilinum - Rubus Fruticosus Woodland, Invertebrate assemblage.

**Windsor Forest & Great Park designated feature(s): Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion), Old acidophilous oak woods with Quercus robur on sandy plains and Limoniscus violaceus and Lucanus cervus.

^^Southwest London Waterbodies suggested designated feature(s): Improved grasslands, Broadleaved, Mixed and Yew Woodland, Rivers and streams, Standing open water and canals, Eutrophic Standing Waters and Rivers.

3.3 Summary of background data

3.3.1 Human health

Monitoring data from SBC for 2023 was used to represent baseline pollutant concentrations providing a more conservative representation of baseline conditions than the mapped Defra background concentrations projected for 2026.

The maximum measured NO_2 concentration within Slough, AQMA No. 4, 34.6 µg/m^3 at kerbside site SLO29, and the closest measured NO_2 concentration to the site boundary, 20.8 µg/m^3 at roadside site SLO44, were used as conservative representations of 2026 background concentrations at receptors located within and outside the AQMA, respectively (see Table 3-3).

[19] Natural England. (2024). Living England Habitat Map - Phase 4. Natural England. https://naturalengland-defra.opendata.arcgis.com/maps/19aa7b1604434fd7a3b35f2fbfb9c519/about

The closest measured PM_{10} concentration to the site boundary (17.0 µg/m^3 at roadside site SLH12, see Table 3-2), measured in the Slough AQMA No. 3 Extension was used as conservative representations of 2026 background concentrations at receptors located within and outside the AQMA.

The general trend across the 2019 to 2023 datasets in Slough (see section 3.2), as seen in many areas of the UK unaffected by external influences, is a gradual reduction in pollutant concentrations over time. This trend is expected to continue into the opening year (2026) and beyond, as indicated by Defra's 2026 mapped background concentrations across the air quality study area.

The Defra background concentrations set out in Table 3-4 indicated a maximum annual mean concentration of 13.5 µg/m^3 for NO_2 and 14.7 µg/m^3 for PM_{10} across the study area.

A summary of the short-term and long-term background concentrations used in the assessment for human health are set out below in Table 3-6.

Table 3-6 – Summary of background concentrations used in the assessment

Pollutant	Time period	2026 background concentrations, µg/m^3	Source
NO_2	Long-term (Annual)	20.8	Roadside site SLO44 – adjacent to site.
		34.6	Kerbside site SLO29 – Within AQMA.
	Short-term (1h)	41.6	Twice the long-term concentrations above*
		69.2	
PM_{10}	Long-term (Annual)	17.0	Roadside CMS SLH12 – within AQMA.
	Short-term (24h)	34.0	Twice the long-term concentration above*
$PM_{2.5}$	Long-term (Annual)	8.5	Defra mapped value

*In line with the Environment Agency's online guidance for air emissions risk assessment[2], which states: *'When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long-term concentration'.*

3.3.2 Ecological receptors

The relevant data from APIS for ecological receptors (background nitrogen deposition rates) were set out in Table 3-5.

4. Results

4.1 ‘Most likely’ testing scenario

4.1.1 Long-term NO_2 impacts on human health

The maximum modelled annual mean PCs for NO_2 at human health receptors (factored to represent a conservative 24 hours of operation of each of the 84 generators per year), are presented in Table 4-1.

Many of the modelled PCs for the selected existing and future human health receptors were below 1% of the long-term NO_2 AQS objective.

The maximum annual mean NO_2 PC at any modelled human health receptor is 1.1 µg/m^3 at R2. This is a residential property on Hazlemere Road, approximately 45 metres north of Building C. The maximum calculated annual mean NO_2 PEC (using a measured roadside concentration of 20.8 µg/m^3) at this receptor is 21.9 µg/m^3. This is well below the long-term NO_2 AQS objective of 40 µg/m^3.

The maximum annual mean NO_2 PC at any modelled human health receptor within the Slough AQMA No.4 is 0.3 µg/m^3 at AQMA3. This is a residential property on Uxbridge Road, approximately 350 metres south of Building A. The maximum calculated annual mean NO_2 PEC (using a measured kerbside concentration of 34.6 µg/m^3) at this receptor is 34.9 µg/m^3. This is below the long-term NO_2 AQS objective of 40 µg/m^3.

The maximum modelled (factored) annual mean NO_2 PCs are presented as concentration isopleths overlaid on a base map in Figure 4-1. These are interpolated from the maximum individual year results from the five modelled years of data at each point in the Cartesian receptor grid.

On evaluation of the modelled concentrations across the study area (isopleths) and estimated PECs at discrete receptors, the ‘most-likely’ testing scenario is not considered have a significant effect on existing annual mean NO_2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the long-term NO_2 AQS objective is therefore unaffected by the operation of the testing regime, despite the conservative assumptions within the modelling.

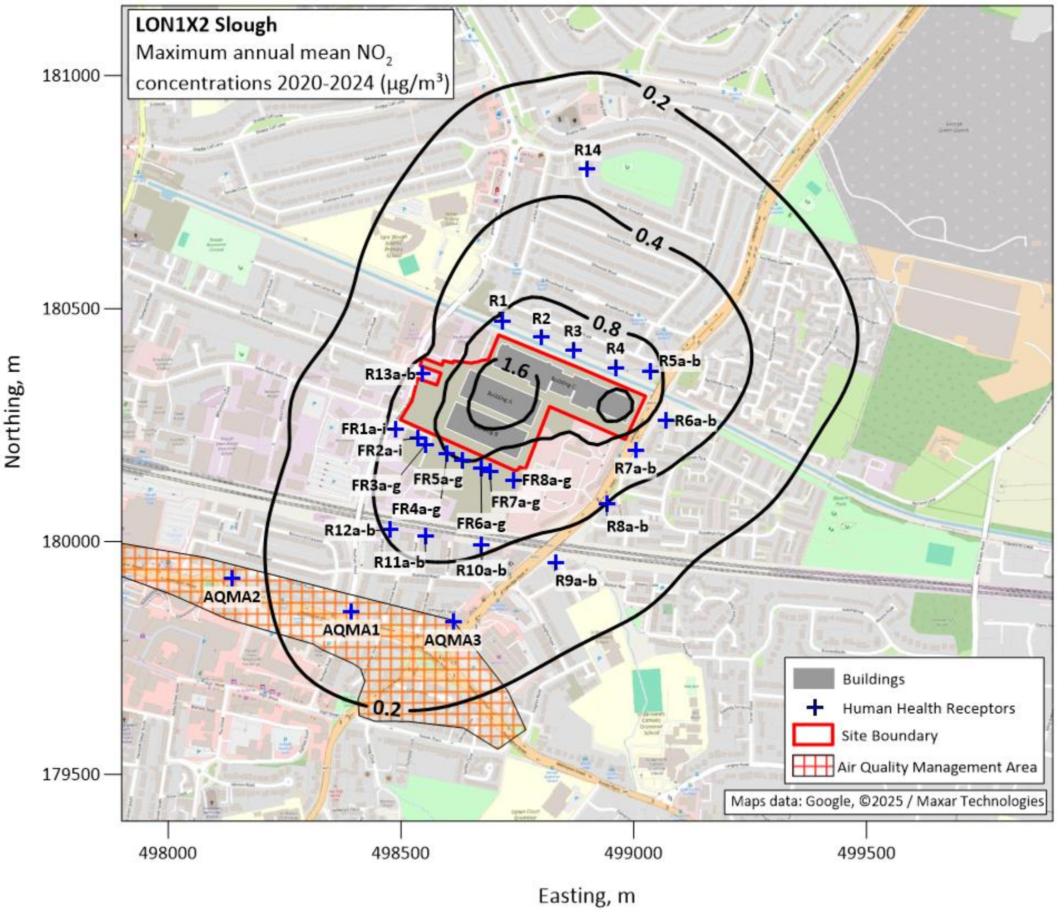
Table 4-1 – Maximum annual average NO_2 concentrations at human health receptors

ID	Description	Baseline, µg/m³	PC*, µg/m³	PC/AQS objective^, %	PEC, µg/m³	PEC/AQS objective^, %
Existing human health receptors						
R1	Hazlemere Road	20.8	0.9	2.2	21.7	54.2
R2	Hazlemere Road	20.8	1.1	2.6	21.9	54.6
R3	Hazlemere Road	20.8	1.0	2.4	21.8	54.4
R4	Hazlemere Road	20.8	1.0	2.4	21.8	54.4
R5(a)	Hazlemere Road	20.8	0.8	2.1	21.6	54.1
R6(a)	Goodman Park	20.8	0.6	1.5	21.4	53.5
R7(a)	Goodman Park	20.8	0.5	1.4	21.3	53.4
R8(a)	Victoria Road	20.8	0.4	1.0	21.2	53.0
R9(a)	Denton Way	20.8	0.3	0.8	21.1	52.8
R10(a)	India Road	20.8	0.4	1.0	21.2	53.0
R11(a)	Australia Road	20.8	0.5	1.1	21.3	53.1
R12(a)	Colonial Road	20.8	0.4	1.0	21.2	53.0
R13(a)	Wrexham Road	20.8	0.5	1.2	21.3	53.2
R14	Maple Crescent	20.8	0.3	0.8	21.1	52.8
AQMA1	Wexham Road	34.6	0.3	0.7	34.9	87.2
AQMA2	Apsley House	34.6	0.2	0.4	34.8	86.9
AQMA3	Uxbridge Road	34.6	0.3	0.7	34.9	87.2
Future human health receptors						
FR1(i)	Residential Block A	20.8	0.4	1.1	21.2	53.1
FR2(i)	Residential Block A	20.8	0.6	1.6	21.4	53.6
FR3(g)	Residential Block B	20.8	0.7	1.7	21.5	53.7
FR4(g)	Residential Block B	20.8	0.8	2.1	21.6	54.1
FR5(g)	Residential Block B	20.8	0.9	2.2	21.7	54.2
FR6(g)	Residential Block B	20.8	0.8	2.0	21.6	54.0
FR7(g)	Residential Block C	20.8	0.7	1.8	21.5	53.8
FR8(g)	Residential Block C	20.8	0.6	1.5	21.4	53.5

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

^Long-term NO_2 AQS objective of 40 µg/m³

Figure 4-1 - Maximum modelled (factored) annual mean NO_2 process contributions (µg/m³)



4.1.2 Long-term PM_{10} impacts on human health

The maximum modelled annual mean PCs for PM_{10} at all human health receptors (factored to represent 24 hours of operation of each of the 84 generators per year) are less than 0.1 µg/m^3 and thus less than 1% of the long-term PM_{10} AQS objective. The modelled concentrations can therefore be assessed as making an insignificant contribution to existing PM_{10} concentrations within the study area.

The same conclusion may be drawn for $PM_{2.5}$, which is assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be less than 1% of the 2040 target value of 10 µg/m^3.

4.1.3 Short-term NO_2 impacts on human health

The maximum modelled 1-hour mean PCs for NO_2 at human health receptors are presented in Table 4-2. These results from the source group apportionment run represent the least favourably placed generator from either the LON1X0 or LON1X2 facilities operating in the vicinity of a receptor, in combination with the least favourable hour of meteorological data from a five year dataset.

The maximum modelled PCs (100^{th} percentile) at human health receptors were above 10% of the short-term NO_2 AQS standard of 200 µg/m^3 for NO_2 (not to be exceeded more than 18 times a year).

The maximum 1-hour mean NO_2 PC at any human health receptor is 89.7 µg/m^3 at FR2. This is a future residential property, approximately 60 metres south of Building A. The calculated PEC at this receptor (using twice the measured roadside concentration, 41.6 µg/m^3), is 131.3 µg/m^3. This is below the short-term NO_2 AQS standard of 200 µg/m^3.

The maximum 1-hour mean NO_2 PC at any existing human health receptor within the Slough AQMA No.4, based on a single generator operating throughout five modelled years, is 47.9 µg/m^3 at AQMA3. The calculated PEC at this receptor (using twice the measured kerbside concentration, 69.2 µg/m^3), is 117.1 µg/m^3. This is below the short-term NO_2 AQS standard of 200 µg/m^3.

Therefore, the modelled concentrations for the 'most-likely' testing scenario are not considered to have a significant effect on hourly NO_2 concentrations either at receptors adjacent to the facility, or further afield within declared AQMAs. The achievement of the short-term NO_2 AQS standard is unaffected, despite the conservative assumptions within the modelling.

An assessment of acute exposure is not required for this scenario, as all maximum concentrations are well below AEGL-1.

The maximum nitrogen monoxide (NO) PC (assuming all NOx is NO) is 256 µg/m^3 an order of magnitude below the Environment Agency's short term criterion of 4,400 µg/m^3.

Table 4-2 – Maximum 1-hour average NO_2 concentrations from any generator, at human health receptors

ID	Description	Baseline, µg/m³	PC*, µg/m³	PC/AQS standard^, %	PEC, µg/m³	PEC/ AQS standard^, %
			Existing human health receptors			
R1	Hazlemere Road	41.6	68.3	34.1	109.9	54.9
R2	Hazlemere Road	41.6	39.9	19.9	81.5	40.7
R3	Hazlemere Road	41.6	34.4	17.2	76.0	38.0
R4	Hazlemere Road	41.6	49.9	25.0	91.5	45.8
R5(a)	Hazlemere Road	41.6	40.3	20.1	81.9	40.9
R6(a)	Goodman Park	41.6	46.5	23.3	88.1	44.1
R7(a)	Goodman Park	41.6	73.6	36.8	115.2	57.6
R8(b)	Victoria Road	41.6	52.3	26.1	93.9	46.9
R9(b)	Denton Way	41.6	54.3	27.1	95.9	47.9
R10(b)	India Road	41.6	48.7	24.3	90.3	45.1
R11(b)	Australia Road	41.6	48.4	24.2	90.0	45.0
R12(b)	Colonial Road	41.6	47.8	23.9	89.4	44.7
R13(a)	Wrexham Road	41.6	45.4	22.7	87.0	43.5
R14	Maple Crescent	41.6	50.2	25.1	91.8	45.9
AQMA1	Wexham Road	69.2	44.9	22.5	114.1	57.1
AQMA2	Apsley House	69.2	39.6	19.8	108.8	54.4
AQMA3	Uxbridge Road	69.2	47.9	24.0	117.1	58.6
			Future human health receptors			
FR1(i)	Residential Block A	41.6	77.7	38.9	119.3	59.7
FR2(i)	Residential Block A	41.6	89.7	44.8	131.3	65.6
FR3(g)	Residential Block B	41.6	69.6	34.8	111.2	55.6
FR4(g)	Residential Block B	41.6	50.2	25.1	91.8	45.9
FR5(a)	Residential Block B	41.6	55.7	27.8	97.3	48.6
FR6(a)	Residential Block B	41.6	58.1	29.0	99.7	49.8
FR7(g)	Residential Block C	41.6	50.6	25.3	92.2	46.1
FR8(g)	Residential Block C	41.6	74.5	37.2	116.1	58.0

*Maximum modelled 1-hour mean PCs based on a single generator operating throughout five modelled years.

^Short-term NO_2 AQS standard of 200 µg/m³ for NO_2 (not to be exceeded more than 18 times a year).

4.1.4 Short-term PM_{10} impacts on human health

The maximum modelled 24-hour mean PCs for PM_{10} at human health receptors are presented in Table 4-3. These results from the source group apportionment run represent the least favourably placed generator from either the LON1X0 or LON1X2 facilities operating in the vicinity of a receptor, in combination with the least favourable hour of meteorological data from a five year dataset..

The modelled PCs (factored to represent 6 hours of operation of a single generator, throughout five modelled years) at human health receptors were all below 10% of the short-term PM_{10} AQS standard of 50 µg/m^3 (not to be exceeded more than 35 days a year).

The maximum 24-hour mean PM_{10} PC at an existing human health receptor, is 0.6 µg/m^3 at FR5. This is a future residential property, approximately 45 metres south of Building A. The calculated PEC at this receptor (using twice the measured roadside concentration, 34.0 µg/m^3), is 34.6 µg/m^3.

Therefore, the modelled concentrations for the 'most-likely' testing scenario are not considered to have a significant effect on existing 24-hour PM_{10} concentrations. The achievement of the short-term PM_{10} AQS standard is unaffected, despite the conservative assumptions within the modelling.

Table 4-3 – Maximum 24-hour average PM_{10} concentrations from a generator, at human health receptors

ID	Description	Baseline, µg/m³	PC*, µg/m³	PC/AQS standard^, %	PEC, µg/m³	PEC/AQS standard^, %
Existing human health receptors						
R1	Hazlemere Road	34.0	0.3	0.6	34.3	68.6
R2	Hazlemere Road	34.0	0.3	0.6	34.3	68.6
R3	Hazlemere Road	34.0	0.3	0.5	34.3	68.5
R4	Hazlemere Road	34.0	0.5	0.9	34.5	68.9
R5(a)	Hazlemere Road	34.0	0.3	0.7	34.3	68.7
R6(a)	Goodman Park	34.0	0.3	0.6	34.3	68.6
R7(a)	Goodman Park	34.0	0.5	0.9	34.5	68.9
R8(a)	Victoria Road	34.0	0.2	0.5	34.2	68.5
R9(a)	Denton Way	34.0	0.1	0.3	34.1	68.3
R10(b)	India Road	34.0	0.2	0.4	34.2	68.4
R11(a)	Australia Road	34.0	0.1	0.3	34.1	68.3
R12(a)	Colonial Road	34.0	0.1	0.3	34.1	68.3
R13(a)	Wrexham Road	34.0	0.3	0.6	34.3	68.6
R14	Maple Crescent	34.0	0.1	0.1	34.1	68.1
AQMA1	Wexham Road	34.0	0.1	0.2	34.1	68.2
AQMA2	Apsley House	34.0	0.1	0.1	34.1	68.1
AQMA3	Uxbridge Road	34.0	0.1	0.2	34.1	68.2
Future human health receptors						
FR1(i)	Residential Block A	34.0	0.2	0.4	34.2	68.4
FR2(i)	Residential Block A	34.0	0.3	0.6	34.3	68.6
FR3(g)	Residential Block B	34.0	0.3	0.6	34.3	68.6
FR4(a)	Residential Block B	34.0	0.4	0.8	34.4	68.8
FR5(a)	Residential Block B	34.0	0.6	1.1	34.6	69.1
FR6(a)	Residential Block B	34.0	0.5	0.9	34.5	68.9
FR7(g)	Residential Block C	34.0	0.3	0.6	34.3	68.6
FR8(g)	Residential Block C	34.0	0.3	0.5	34.3	68.5

*Maximum modelled 24-hour (based on 6 hour) mean PCs based on a single generator operating throughout five modelled years.

^Short-term PM_{10} AQS standard of 50 µg/m³ (not to be exceeded more than 35 days a year).

4.1.5 NO_x impacts on ecological receptors

The maximum modelled annual mean PCs for NO_x at ecological receptors (factored based on 24 hours of operation of all 84 generators annually) are presented in Table 4-4.

The maximum annual mean NO_x PC at an ecological receptor, 0.2 µg/m³ occurred at E1, Herschel Park LNR, approximately 1.4 kilometres south of Building A. The modelled annual mean NO_x PCs at all the modelled ecological receptors were all equal to or below 1% of the critical level (CL) of 30 µg/m³.

Table 4-4 – Maximum annual and hourly average NO_x concentrations at ecological receptors

ID	Description	Long-term		Short-term	
		PC*, µg/m³	PC/CL^, %	PC**, µg/m³	PC/CL#, %
E1	Herschel Park	0.1	0.2	0.7	1.0
E2	Burnham Beeches	<0.1	<0.1	0.1	0.1
E3	Windsor Forest & Great Park	<0.1	<0.1	0.1	0.1
E4	Southwest London Waterbodies	<0.1	<0.1	0.2	0.2

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

^Long term critical level of 30 µg/m³.

** Maximum modelled 24-hour (based on 6 hour) mean PCs based on a single generator operating throughout five modelled years.

#Short-term critical level of 75 µg/m³.

The maximum 24-hour mean NO_x PC (factored to represent 6 hours of operation of a single generator, throughout five modelled years) at an ecological receptor, is 0.7 µg/m³, which also occurred at E1. This conservative approach considers the least favourably placed generator from the LON1X0 and LON1X2 facilities (Generator 53, Building C) operating in the vicinity of the receptor, in combination with the least favourable hour of meteorological data, which occurred in 2023.

The PCs at all modelled ecological receptors were below 10% of the non-statutory critical level of 75 µg/m³ (a conservative choice, compared to using the higher value of 200 µg/m³ for low pollution areas) and as such can be considered insignificant.

4.1.6 Nitrogen deposition impacts on ecological receptors

The total nitrogen deposition PCs at ecological receptors (factored for 24 hours of operation of all 84 generators annually) are presented in Table 4-5.

The maximum annual mean nitrogen deposition PC at an ecological receptor, is 0.013 kgN/ha/yr at E1.

The modelled annual mean nitrogen deposition PCs at all the modelled ecological receptors were all below 1% of the minimum critical load for nitrogen deposition. As such, the modelled concentrations make an insignificant contribution to existing rates of nitrogen deposition at ecological receptors within the study area.

Table 4-5 – Maximum total nitrogen deposition at ecological receptors

ID	Description	Minimum Critical Load, kgN/ha/yr	Total N Deposition PC*, kgN/ha/yr	PC/Critical Load, %
E1	Herschel Park	5	0.013	0.3
E2	Burnham Beeches	10	0.001	<0.1
E3	Windsor Forest & Great Park	10	0.002	<0.1
E4	Southwest London Waterbodies	5	0.001	<0.1

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

4.1.7 Acid deposition impacts on ecological receptors

The total N-acid deposition PCs at ecological receptors (factored based on 24 hours of operation of all 84 generators annually) are presented in Table 4-6.

The maximum annual mean N-acid deposition PC at an ecological receptor is 0.001 keq/ha/yr at E1.

The modelled PCs at all the ecological receptors were below 0.1% of the N-acid deposition critical load. As such, the PCs make an insignificant contribution to existing rates of N-acid deposition at ecological receptors within the study area.

Table 4-6 – Maximum total N-acid deposition at ecological receptors

ID	Description	MinCLMaxN, keq/ha/yr	N-Acid Deposition PC*, keq/ha/yr	PC/Critical Load, %
E1	Herschel Park	4.363	0.001	<0.1
E2	Burnham Beeches	2.056	<0.001	<0.1
E3	Windsor Forest & Great Park	1.044	<0.001	<0.1
E4	Southwest London Waterbodies	1.761	<0.001	<0.1

*Maximum modelled annual mean PCs, factored to represent 24 hours of operation of all 84 generators per year.

4.2 ‘Emergency’ Scenario

4.2.1 Long-term NO_2 impacts on human health

As it is possible that both the ‘most-likely’ and ‘emergency’ scenarios could occur within the same year, their combined impact is presented in this section.

The maximum modelled annual mean PCs for NO_2 at human health receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent totals of 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-1 in Appendix B.

4.2.1.1 4-hour emergency event (reasonable worst case)

For a 4-hour emergency event combined with routine testing, the maximum annual mean NO_2 PC at any modelled human health receptor is 1.2 µg/m^3 at receptor R2; within an AQMA it is 0.3 µg/m^3 at receptor AQMA3 within the Slough AQMA No.4. The corresponding annual mean NO_2 PECs, based on the baseline concentrations set out in Table 3-6, are 22.0 µg/m^3 and 34.9 µg/m^3, respectively.

Therefore, the modelled concentrations at all receptors remain below the long-term NO_2 AQS objective of 40 µg/m^3.

4.2.1.2 12-hour emergency event

For a 12-hour emergency event combined with routine testing, the maximum annual mean NO_2 PC at any modelled human health receptor is 1.6 µg/m^3 at receptor R2; within an AQMA it is 0.4 µg/m^3 at receptor AQMA3 within the Slough AQMA No.4. The corresponding annual mean NO_2 PECs, based on the baseline concentrations set out in Table 3-6, are 22.4 µg/m^3 and 35.0 µg/m^3, respectively.

Therefore, the modelled concentrations at all receptors remain below the long-term NO_2 AQS objective of 40 µg/m^3, even with the conservative assumption of three times the reasonable worst-case emergency event.

4.2.1.3 72-hour emergency event

For a 72-hour emergency event combined with routine testing, the maximum annual mean NO_2 PC at any modelled human health receptor is 4.2 µg/m^3 at receptor R2; within an AQMA it is 1.2 µg/m^3 at receptor AQMA3 within the Slough AQMA No.4. The corresponding annual mean NO_2 PECs, based on the baseline concentrations set out in Table 3-6, are 31.3 µg/m^3 and 37.6 µg/m^3, respectively.

Therefore, the modelled concentrations at all receptors remain below the long-term NO_2 AQS objective of 40 µg/m^3, even with the extremely conservative assumption of a 72-hour emergency event.

4.2.2 Long-term PM_{10} impacts on human health

The maximum modelled annual mean PCs for PM_{10} at human health receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-2 in Appendix B.

4.2.2.1 4-hour emergency event (reasonable worst case)

For a 4-hour emergency event combined with routine testing, the maximum annual mean PM_{10} PC at any modelled human health receptor is 0.04 µg/m^3 at receptor R2. The corresponding annual mean PEC, based on the baseline concentration set out in Table 3-6, is 17.04 µg/m^3.

Therefore, the modelled concentrations at all receptors remain well below the long-term PM_{10} AQS objective of 40 µg/m^3.

The same conclusion may be drawn for $PM_{2.5}$, which can be conservatively assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be less than 1% of the 2040 target value of 10 µg/m^3.

4.2.2.2 12-hour emergency event

For a 12-hour emergency event combined with routine testing, the maximum annual mean PM_{10} PC at any modelled human health receptor is 0.05 µg/m^3 at receptor R2. The corresponding annual mean PEC, based on the baseline concentration set out in Table 3-6, is 17.05 µg/m^3.

Therefore, the modelled concentrations at all receptors remain well below the long-term PM_{10} AQS objective of 40 µg/m^3, even with the conservative assumption of three times the reasonable worst-case emergency event.

The same conclusion may be drawn for $PM_{2.5}$, which can be conservatively assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be less than 1% of the 2040 target value of 10 µg/m^3.

4.2.2.3 72-hour emergency event

For a 72-hour emergency event combined with routine testing, the maximum annual mean PM_{10} PC at any modelled human health receptor is 0.1 µg/m^3 at receptor R2. The corresponding annual mean PEC, based on the baseline concentration set out in Table 3-6, is 17.1 µg/m^3.

Therefore, the modelled concentrations at all receptors remain well below the long-term PM_{10} AQS objective of 40 µg/m^3, even with the extremely conservative assumption of a 72-hour emergency event.

The same conclusion may be drawn for $PM_{2.5}$, which can be conservatively assumed to be the same as PM_{10}. On that basis, the maximum annual mean PC would be equal to 1% of the 2040 target value of 10 µg/m^3 and less than 1% of the interim target of 12 µg/m^3 by 2028.

4.2.3 Short-term NO_2 impacts on human health

The maximum modelled hourly NO_2 PC for the concurrent operation of all generators (100th percentile) is 2,008 µg/m^3. This is the absolute highest concentration at any modelled receptor in a five-year run and assumes operation of all 84 engines at maximum load during the least favourable hour of meteorological data in over 43,000 modelled hours. The modelling assumed no derating or load-shedding.

The number of exceedances of the short-term NO_2 AQS standard and the AEGL-1 threshold at human health receptors in each year modelled, assuming a hypothetical continuous outage throughout the year, is presented in Table 4-7. These results inform the statistical analysis of the probability of an exceedance occurring for a range of durations of a power outage presented later in this section.

Table 4-7 – No. of NO_2 hourly exceedances in a year at a receptor (all modelled hours in a year, all generators concurrently operating)

Year	No. of NO_2 hourly exceedances in a year			
	>200 µg/m^3 (AQS standard)		>940 µg/m^3 (AEGL-1 threshold)	
	Min	Max	Min	Max
2020	539	3936	0	186
2021	599	3223	0	197
2022	482	3722	0	215
2023	457	4172	0	213
2024	381	3862	0	271

The results at individual receptors show that, based on all engines operating throughout the year, between 381 and 4,172 hours were identified to exceed the short-term NO_2 AQS standard and between 0 and 271 hours were identified to exceed the AEGL-1 of 0.5 ppm (approximately 940 µg/m^3), the threshold for non-disabling effects, in any modelled year. No exceedances of the AEGL-2 of 12 ppm (23,000 µg/m^3) the threshold for disabling effects, were modelled.

The maximum modelled hourly mean NO_2 PCs are presented as concentration isopleths overlaid on a base map in Figure B-1 in Appendix B. These are the maximum modelled results from the five modelled years of data at each receptor.

4.2.3.1 4-hour (reasonable worst case)

For the 4-hour emergency event, which is considered a reasonable worst case emergency scenario, while an exceedance of the short-term NO_2 AQS standard of 200 µg/m^3 under least favourable conditions may occur, it is not expected to affect the achievement of the short-term NO_2 AQS objective (which allows for 18 hours above the standard each year). The probability of the AEGL-1 being exceeded even once is under 30%, and the probability it being exceeded twice within the 4 hour period is less than 1.5%.

4.2.3.2 12-hour emergency event

For the 12-hour emergency event, as per the 4-hour emergency event, even if an exceedance of the short-term NO_2 AQS standard of 200 µg/m^3 were to occur under least favourable conditions, this would be of limited duration and thus not expected to affect the achievement of the short-term NO_2 AQS objective (no more than 18 hours above the standard each year). The probability that the AEGL-1 would be exceeded for one hour during this event is 31%, and for three hours is less than 1.5%

4.2.3.3 72-hour emergency event and acute exposure

During a highly improbable 72-hour emergency event, the short-term NO_2 AQS objective (200 µg/m^3 not to be exceeded more than 18 times a year) is likely to be exceeded, as is the AEGL-1. This is based on the hypergeometric mean calculation for a full emergency outage lasting 72 hours per year as set out in detail in Appendix B, Table B-3. The calculation shows the probability of exceeding:

- the short-term NO_2 AQS standard more than 18 times at a residential receptor is 99.99% (249.98% with a factor of 2.5 applied for consecutive hours of outage); and
- the AEGL-1 threshold once at a residential receptor is 89.69% (224.22% with a factor of 2.5 applied);
- the AEGL-1 threshold four times at a residential receptor is 18.29% (45.74% with a factor of 2.5 applied);
- the AEGL-1 threshold eight times at a residential receptor is 0.16% (0.41% with a factor of 2.5 applied).

Therefore, there is a theoretical potential for concentrations of NO_2 resulting from the simultaneous operation of all 84 generators for 72 hours to exceed both the short-term NO_2 AQS objective and the AEGL-1 threshold under least favourable dispersion conditions, however, the probability of an outage lasting 72 hours is infinitesimally low. An emergency power outage of a few hours' duration is only estimated to occur once every 23 years[10]. The probability of an emergency power outage of a longer duration coinciding with the worst individual hours of meteorological conditions from a five-year dataset is thus far lower.

A slightly less conservative, yet still unlikely, outage of 24 hours has been considered and the results are presented in Appendix B, Table B-3. For 24 hours the calculation shows the probability of exceeding:

- the short-term NO_2 AQS standard more than 18 times at a residential receptor is 0.16% (0.40% with a factor of 2.5 applied); and
- the AEGL-1 threshold once at a residential receptor is 53.01% (132.52% with a factor of 2.5 applied);
- the AEGL-1 threshold four times at a residential receptor is 0.58% (1.46% with a factor of 2.5 applied).

The hypergeometric mean calculations indicate that while there is a risk of exceeding the AEGL-1 threshold at a residential receptor in the unlikely event there is 24 hours of outages in a year, the probability of exceeding it more than four times is extremely remote (less than 1%), as is the probability of the short-term NO_2 AQS objective at a residential receptor (the indicative threshold for likely exceedances given in Environment Agency guidance[20] for specified generators is 5%).

It is important to note that, while all engines would initially be fired up to maintain data supply, it is anticipated that load shedding would occur after a short period. This would reduce the number of operational generators and/or the associated NO_x emissions. The modelling undertaken to generate the above statistics assumes continuous full load operation of all 84 generators, a very conservative approach. In practice, load shedding is likely to occur, meaning actual concentrations would be lower than those modelled.

[20] Environment Agency (2023). Specified generators: dispersion modelling assessment. Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment

4.2.4 Short-term PM_{10} impacts on human health

4.2.4.1 4-hour (reasonable worst case), 12-hour and 72-hour emergency events

The maximum modelled 24-hour PM_{10} PC for the concurrent operation of all generators (100th percentile) is 51.8 µg/m^3. This finding represents the absolute highest concentration at a receptor in a five-year model run and assumes continuous operation thus representing the least favourable year of meteorological data in over 44,000 modelled hours. This is not a realistic scenario and represents a theoretical maximum. Nevertheless, it only marginally exceeds the short-term PM_{10} AQS standard of 50 µg/m^3.

While the 'most-likely' and 'emergency' scenarios are considered separate scenarios, it is possible that both could occur within the same year. However, as set out in section 4.1.4, no exceedances of the short-term PM_{10} AQS standard of 50 µg/m^3 were identified. Therefore, the cumulative contribution of the 'most-likely' testing scenario to the short-term PM_{10} AQS objective of 35 days above the standard does not need to be considered.

For the 4-hour, 12-hour and 72-hour emergency events, even were an exceedance of the short-term PM_{10} AQS standard of 50 µg/m^3 to occur under least favourable meteorological conditions, it will be limited in duration and is not expected to affect the achievement of the short-term NO_2 AQS objective which allows for 35 days above the standard each year.

4.2.5 NO_x impacts on ecological receptors

The maximum modelled annual mean PCs for NO_x at ecological receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-4 in Appendix B.

For the emergency events, the highest annual mean NO_x PC at any modelled ecological receptor occurred at Herschel Park.

4.2.5.1 4-hour emergency event (reasonable worst case)

When factored for a theoretical 4-hour full emergency outage within a year, the PC at Herschel Park LNR is 0.08 μg/m^3 or 0.3% of the critical level (long-term NO_x: 30 μg/m^3). Therefore, under a 4-hour emergency event, the annual mean NO_x PCs at all modelled ecological receptor is below 1% of the NO_x critical level.

This scenario is based on regional estimates suggesting that such events may occur approximately once every 23 years and, along with the conservative parameters used within the model, is considered a reasonable worst-case. The theoretical 12-hour and 72-hour emergency events are considered extremely unlikely and are reported below completeness.

4.2.5.2 12-hour emergency event

When factored for a theoretical 12-hour full emergency outage within a year, the PC at Herschel Park LNR is 0.10 μg/m^3 or 0.3% of the NO_x critical level. Therefore, under a 12-hour emergency event, the annual mean NO_x PCs at all modelled ecological receptor is below 1% of the NO_x critical level.

4.2.5.3 72-hour emergency event

When factored for a theoretical 72-hour full emergency outage within a year, the PC at Herschel Park LNR is 0.26 μg/m^3 or 0.9% of the NO_x critical level. Therefore, under a 72-hour emergency event, the annual mean NO_x PCs at all modelled ecological receptor is below 1% of the NO_x critical level.

4.2.6 Nitrogen deposition impacts on ecological receptors

The maximum modelled total nitrogen deposition PCs at ecological receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-5 in Appendix B.

For the emergency events, the highest total nitrogen deposition PC at any modelled ecological receptor occurred at Herschel Park.

4.2.6.1 4-hour emergency event (reasonable worst case)

When adjusted for a theoretical 4-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.015 µg/m^3 or 0.3% of the lowest minimum critical load (5 kgN/ha/yr). Therefore, under a 4-hour emergency event, the total nitrogen deposition PCs at all modelled ecological receptors were all well below 1% of the relevant minimum critical loads for nitrogen deposition.

This scenario is based on regional estimates suggesting that such events may occur approximately once every 23 years and, along with the conservative parameters used within the model, is considered a reasonable worst-case. The theoretical 12-hour and 72-hour emergency events are considered extremely unlikely and are reported below completeness.

4.2.6.2 12-hour emergency event

When adjusted for a theoretical 12-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.020 µg/m^3 or 0.4% of the lowest minimum critical load. Therefore, under a 12-hour emergency event, the total nitrogen deposition PCs at all modelled ecological receptors were all well below 1% of the relevant minimum critical loads for nitrogen deposition.

4.2.6.3 72-hour emergency event

When adjusted for a theoretical 72-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.052 µg/m^3 or 1.0% of the lowest minimum critical load. Therefore, under a 72-hour emergency event, the total nitrogen deposition PCs at all modelled ecological receptors were all below or equal to 1% of the relevant minimum critical loads for nitrogen deposition.

4.2.7 Acid deposition impacts on ecological receptors

The maximum modelled total N-acid deposition PCs at ecological receptors for the 4-hour, 12-hour and 72-hour emergency events (factored to represent 28, 36 and 96 hours of operation of each of 84 generators per year), are presented in Table B-6 in Appendix B.

For the emergency events, the highest total N-acid deposition PCs at any modelled ecological receptor occurred at Herschel Park.

4.2.7.1 4-hour emergency event (reasonable worst case)

When adjusted for a theoretical 4-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.001 keq/ha/yr, equivalent to 0.03% of the minimum critical load (4.363 MinCLMaxN). Under a 4-hour emergency event, the total N-acid deposition PCs at all ecological receptors were all well below 1% of the relevant minimum N-acid deposition critical loads.

This scenario is based on regional estimates suggesting that such events may occur approximately once every 23 years and, along with the conservative parameters used within the model, is considered a reasonable worst-case. The theoretical 12-hour and 72-hour emergency events are considered extremely unlikely and are reported below completeness.

4.2.7.2 12-hour emergency event

When adjusted for a theoretical 12-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.001 keq/ha/yr, equivalent to 0.03% of the minimum critical load. Under a 12-hour emergency event, the total N-acid deposition PCs at all ecological receptors were all well below 1% of the relevant minimum N-acid deposition critical loads.

4.2.7.3 72-hour emergency event

When adjusted for a theoretical 72-hour full emergency outage within a year, the Herschel Park LNR has a PC of 0.004 keq/ha/yr, equivalent to 0.09% of the minimum critical load. Under a 72-hour emergency event, the total N-acid deposition PCs at all ecological receptors were all well below 1% of the relevant minimum N-acid deposition critical loads.

5. Conclusions

This air quality assessment included an atmospheric dispersion modelling study of emissions from the 32 standby emergency generators associated with the LON1X2 facility (Building C) in addition to the 52 standby emergency generators associated with the adjacent LON1X0 facility (Building A and B). The detailed assessment of the emissions has been undertaken using an internationally accepted model (AERMOD) to evaluate the impacts on human health and ecology during scheduled routine testing ('most-likely' testing scenario) and during a power outage ('worst case' emergency scenario).

For the 'most-likely' testing scenario, no exceedances of the short-term and long-term assessment criteria for NO_2, PM_{10} or $PM_{2.5}$ were identified at any human health receptors, either in proximity to the facility or beyond, including the Slough AQMA No.4. Furthermore, the contributions at ecological receptors were less than 1% of the long-term critical levels and loads and less than 10% of the short-term critical level.

For the 'worst case emergency' scenario, hypothetical outages of 4, 12 and 72 hour duration were considered. The modelling shows that for a full outage, exceedances of both the hourly NO_2 AQS standard and the AEGL-1 could occur, but the AEGL-2 will not be exceeded. This assumes a full outage requiring all engines to operate at load coincides with the very least favourable hours of meteorological data for dispersion. The probability of this happening is extremely low as such an outage is a 1 in 23 years event. Further calculations using the hypergeometric mean approach have shown that, for 24 hours of power outage in a year, the probability of an exceedance of the AQS objective for a cumulative outage across all sites is below 1%, while the probability of the AEGL-1 being exceeded on more than 4 occasions is less than 2%.

In summary, the operation of individual generators at the expanded facility for routine testing is concluded not to present a significant adverse effect on the nearest sensitive human health and ecological receptors. During a worst case emergency outage, the hourly standard for NO_2 and the AEGL-1 level for non-disabling health effects may be exceeded; however, the probability of such an event coinciding with the least favourable hours of meteorological data for dispersion is extremely low.

It is anticipated that an air quality management plan will be required under the environmental permit, to set out the actions that will be taken and those responsible, in the unlikely event of an emergency power outage in order to prevent adverse effects on public health.

APPENDICES

Appendix A. Additional information

Table A-1 – Building A stack locations and height – LON1X0 facility

Stack ID	X, m	Y, m	Stack height, m
Building A Stack 1	498623	180299	21.95
Building A Stack 2	498625	180298	
Building A Stack 3	498632	180295	
Building A Stack 4	498634	180294	
Building A Stack 5	498642	180291	
Building A Stack 6	498644	180290	
Building A Stack 7	498652	180286	
Building A Stack 8	498654	180285	
Building A Stack 9	498662	180282	
Building A Stack 10	498664	180281	
Building A Stack 11	498672	180278	
Building A Stack 12	498674	180277	
Building A Stack 13	498682	180274	
Building A Stack 14	498684	180273	
Building A Stack 15	498692	180269	
Building A Stack 16	498694	180268	
Building A Stack 17	498702	180265	
Building A Stack 18	498704	180264	
Building A Stack 19	498712	180261	
Building A Stack 20	498714	180260	
Building A Stack 21	498722	180257	
Building A Stack 22	498724	180256	
Building A Stack 23	498732	180252	
Building A Stack 24	498734	180251	
Building A Stack 25	498742	180248	
Building A Stack 26	498744	180247	

Table A-2 – Building B stack locations and height – LON1X0 facility

Stack ID	X, m	Y, m	Stack height, m
Building B Stack 27	498652	180366	21.95
Building B Stack 28	498654	180365	
Building B Stack 29	498661	180362	
Building B Stack 30	498663	180361	
Building B Stack 31	498671	180357	
Building B Stack 32	498673	180356	
Building B Stack 33	498681	180353	
Building B Stack 34	498683	180352	
Building B Stack 35	498691	180349	
Building B Stack 36	498693	180348	
Building B Stack 37	498701	180345	
Building B Stack 38	498703	180344	
Building B Stack 39	498711	180340	
Building B Stack 40	498713	180339	
Building B Stack 41	498721	180336	
Building B Stack 42	498723	180335	
Building B Stack 43	498731	180332	
Building B Stack 44	498733	180331	
Building B Stack 45	498741	180328	
Building B Stack 46	498743	180327	
Building B Stack 47	498751	180323	
Building B Stack 48	498753	180322	
Building B Stack 49	498760	180319	
Building B Stack 50	498763	180318	
Building B Stack 51	498770	180315	
Building B Stack 52	498773	180314	

Table A-3 – Building C stack locations and height – LON1X2 facility

Stack ID	X, m	Y, m	Stack height, m
Building C Stack 53	498699	180378	15.95
Building C Stack 54	498703	180376	
Building C Stack 55	498710	180373	
Building C Stack 56	498713	180372	
Building C Stack 57	498720	180369	
Building C Stack 58	498723	180368	
Building C Stack 59	498729	180365	
Building C Stack 60	498733	180363	
Building C Stack 61	498739	180361	
Building C Stack 62	498743	180359	
Building C Stack 63	498749	180356	
Building C Stack 64	498753	180355	
Building C Stack 65	498759	180352	
Building C Stack 66	498763	180350	
Building C Stack 67	498769	180348	
Building C Stack 68	498773	180346	
Building C Stack 69	498908	180288	
Building C Stack 70	498911	180287	
Building C Stack 71	498918	180284	
Building C Stack 72	498922	180282	
Building C Stack 73	498928	180280	
Building C Stack 74	498931	180278	
Building C Stack 75	498938	180275	
Building C Stack 76	498941	180274	
Building C Stack 77	498948	180271	
Building C Stack 78	498951	180270	
Building C Stack 79	498958	180267	
Building C Stack 80	498961	180265	
Building C Stack 81	498968	180262	
Building C Stack 82	498971	180261	
Building C Stack 83	498978	180258	
Building C Stack 84	498981	180257	

Appendix B. 'Emergency' scenario results

Figure B-1 - Maximum modelled 1-hour mean NO_2 process contributions (µg/m^3)

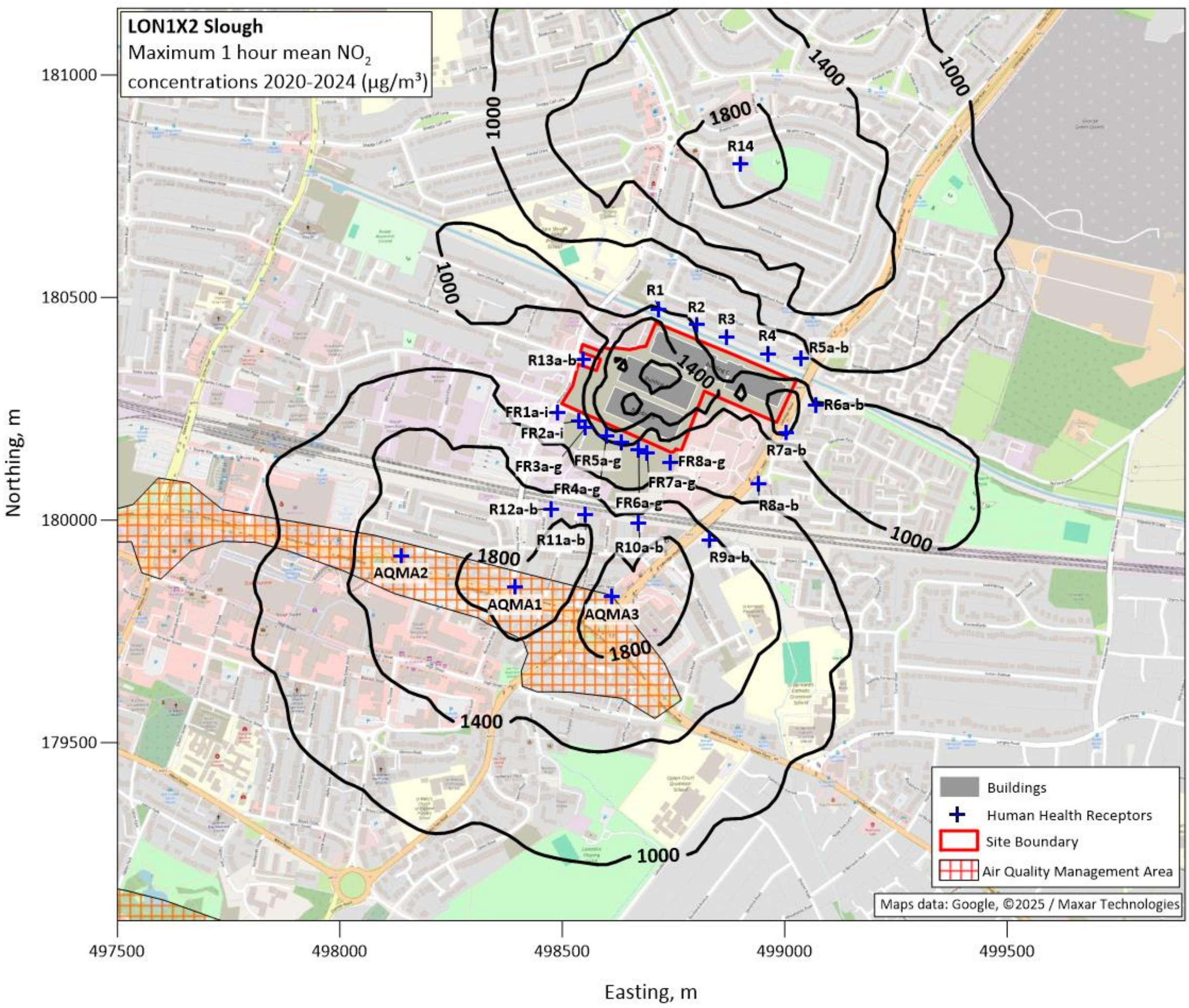


Table B-1 - Maximum annual average NO_2 concentrations at human health receptors for the emergency events

ID	Description	Baseline, µg/m³	Emergency event*		
			4-hour PC, µg/m³	12-hour PC, µg/m³	72-hour PC, µg/m³
R1	Hazlemere Road	20.8	1.0	1.3	3.5
R2	Hazlemere Road	20.8	1.2	1.6	4.2
R3	Hazlemere Road	20.8	1.1	1.5	3.9
R4	Hazlemere Road	20.8	1.1	1.4	3.9
R5a-b	Hazlemere Road	20.8	1.0	1.3	3.3
R6a-b	Goodman Park	20.8	0.7	0.9	2.5
R7a-b	Goodman Park	20.8	0.6	0.8	2.2
R8a-b	Victoria Road	20.8	0.5	0.6	1.6
R9a-b	Denton Way	20.8	0.4	0.5	1.3
R10a-b	India Road	20.8	0.5	0.6	1.7
R11a-b	Australia Road	20.8	0.5	0.7	1.8
R12a-b	Colonial Road	20.8	0.5	0.6	1.7
R13a-b	Wrexham Road	20.8	0.5	0.7	1.9
R14	Maple Crescent	20.8	0.4	0.4	1.3
AQMA1	Wexham Road	34.6	0.3	0.4	1.1
AQMA2	Apsley House	34.6	0.2	0.2	0.7
AQMA3	Uxbridge Road	34.6	0.3	0.4	1.2
FR1a-i	Residential Block A	20.8	0.5	0.7	1.7
FR2a-i	Residential Block A	20.8	0.7	1.0	2.6
FR3a-g	Residential Block B	20.8	0.8	1.0	2.6
FR4a-g	Residential Block B	20.8	1.0	1.2	3.3
FR5a-g	Residential Block B	20.8	1.0	1.3	3.5
FR6a-g	Residential Block B	20.8	0.9	1.2	3.2
FR7a-g	Residential Block C	20.8	0.8	1.1	2.9
FR8a-g	Residential Block C	20.8	0.7	0.9	2.3

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-2 - Maximum annual average PM_{10} concentrations at human health receptors for the emergency events

ID	Description	Baseline, µg/m³	Emergency event*		
			4-hour PC, µg/m³	12-hour PC, µg/m³	72-hour PC, µg/m³
R1	Hazlemere Road	17.0	<0.1	<0.1	0.1
R2	Hazlemere Road		<0.1	<0.1	0.1
R3	Hazlemere Road		<0.1	<0.1	0.1
R4	Hazlemere Road		<0.1	<0.1	0.1
R5a-b	Hazlemere Road		<0.1	<0.1	0.1
R6a-b	Goodman Park		<0.1	<0.1	<0.1
R7a-b	Goodman Park		<0.1	<0.1	<0.1
R8a-b	Victoria Road		<0.1	<0.1	<0.1
R9a-b	Denton Way		<0.1	<0.1	<0.1
R10a-b	India Road		<0.1	<0.1	<0.1
R11a-b	Australia Road		<0.1	<0.1	<0.1
R12a-b	Colonial Road		<0.1	<0.1	<0.1
R13a-b	Wrexham Road		<0.1	<0.1	<0.1
R14	Maple Crescent		<0.1	<0.1	<0.1
AQMA1	Wexham Road		<0.1	<0.1	<0.1
AQMA2	Apsley House		<0.1	<0.1	<0.1
AQMA3	Uxbridge Road		<0.1	<0.1	<0.1
FR1a-i	Residential Block A		<0.1	<0.1	<0.1
FR2a-i	Residential Block A		<0.1	<0.1	<0.1
FR3a-g	Residential Block B		<0.1	<0.1	<0.1
FR4a-g	Residential Block B		<0.1	<0.1	0.1
FR5a-g	Residential Block B		<0.1	<0.1	0.1
FR6a-g	Residential Block B		<0.1	<0.1	<0.1
FR7a-g	Residential Block C		<0.1	<0.1	<0.1
FR8a-g	Residential Block C		<0.1	<0.1	<0.1

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-3 – Hypergeometric mean calculation for theoretical 24h and 72h outages

ID	Description	AQS standard >18 times		AEGL-1 1 or 4 times		Comment
		24h	**72h**	**24h**	**72h**	
x	No. successes in the sample	5	53	23	71	Operational hours minus number of "allowed" exceedances
n	Sample size	24	72	24	72	No. emergency operational hours
M	No. successes in the population	4588	4588	8552	8552	Non-exceedance hours per year
N	Population size	8760	8760	8760	8760	Potential operating envelope per year
-	-	4172	4172	271	271	No. hours modelled to exceed per year
-	-	19	19	1 / 4	1 / 4	No. exceedances allowed by the objective or threshold
Result	Hypergeometric distribution	0.16%	99.99%	53.01% / 0.58%	89.69% / 18.29%	Probability of < 5% indicates exceedances are unlikely as long as the generator plant operational lifetime is no more than 20 years
		0.40%	249.98%	132.52% / 1.46%	224.22% / 45.74%	Factor of 2.5 applied for consecutive hours of emergency operation

Table B-4 - Maximum annual average NOx concentrations (μg/m³) at ecological receptors for the emergency events

ID	Description	Critical level, μg/m³	Emergency event*		
			4-hour PC	12-hour PC	72-hour PC
E1	Herschel Park	30	0.08	0.10	0.26
E2	Burnham Beeches		0.01	0.01	0.02
E3	Windsor Forest & Great Park		0.01	0.02	0.04
E4	Southwest London Waterbodies		0.01	0.01	0.03

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-5 - Maximum total nitrogen deposition (kgN/ha/yr) at ecological receptors for the emergency events

ID	Description	Minimum Critical Load, kgN/ha/yr	Emergency event*		
			4-hour PC	12-hour PC	72-hour PC
E1	Herschel Park	5	0.015	0.020	0.052
E2	Burnham Beeches	10	0.001	0.002	0.004
E3	Windsor Forest & Great Park	10	0.002	0.003	0.008
E4	Southwest London Waterbodies	5	0.001	0.001	0.003

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.

Table B-6 - Maximum total N-acid deposition (keq/ha/yr) at ecological receptors for the emergency events

ID	Description	MinCLMaxN, keq/ha/yr	Emergency event*		
			4-hour PC	12-hour PC	72-hour PC
E1	Herschel Park	4.363	0.001	0.001	0.004
E2	Burnham Beeches	2.056	<0.001	<0.001	<0.001
E3	Windsor Forest & Great Park	1.044	<0.001	<0.001	0.001
E4	Southwest London Waterbodies	1.761	<0.001	<0.001	<0.001

*Maximum modelled annual mean PCs, factored to represent the emergency event + 24 hours of operation of all 84 generators per year.