ENVIRONMENTAL PERMIT VARIATION APPLICATION DOCKLANDS CAMPUS

Air Emissions Risk Assessment

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1.0 INTRODUCTION

SLR Consulting Limited (SLR) has been instructed by Telehouse International Corporation of Europe Limited (Telehouse) to prepare an Environmental Permit (EP) variation application for the Telehouse South (TS) data centre (EP reference EPR/EP3507SL), located at Blackwall Way, Poplar, London, E14 2EH (the 'Installation').

The EP variation addresses the following:

- Consolidation of the currently separately permitted Docklands data centre (now referred to as Telehouse North (TN)) (EP reference EPR/SP3237JU)), located on Coriander Avenue, London, with the TS EP. The combined TN and TS data centres will be referred to as the Docklands Campus.
- TS is undergoing extensive refurbishment, including the replacement of diesel-fired standby generators (SBGs); this EP variation application includes details of the planned changes.
- Since issue of the TN EP, a number of SBGs, which were included as 'future SBGs' in the EP, have been installed, as agreed with the EA in accordance with the EP pre-operational condition. At the request of the EA, this EP variation includes details of all the SBGs currently in place at TN.

1.1 Background

The current TN EP issued by the Environment Agency (EA) covers 27 emission points to air, associated with 27 SBGs. Currently, there are a total of 24 SBGs operating at TN. The SBGs are contained within 4 buildings, known as North Building, East Building, West Building and North 2 Building.

The current TS EP issued by the EA covers 13 emission points to air: 4 x 6.4MWth SBGs (in the DTC Building), 6 x 6.3MWth SBGs (in the EUB Building) and 3 x 1.172MWth boiler units. It is proposed to remove the boiler units and replace all 10 SBGs with 10 new SBGs, which will be housed in the EUB Building. The new TS SBGs will be fitted with Selective Catalytic Reduction (SCR) to reduce nitrogen oxides (NO_x) exhaust emissions, with all stacks changed to vertical orientation – therefore representing an improvement on the current situation.

The primary purpose of the SBGs is to provide emergency back-up electrical power to the Installation in the event that electricity is not available from the local transmission network (e.g. brown- or black-out) or if there is an internal failure of power supply. The SBGs also operate during a routine testing and maintenance schedule.

Full details of the application are detailed within the non-technical summary (NTS) and accompanying application. This report presents the Air Emissions Risk Assessment (AERA) undertaken to support the EP variation application.

1.2 Scope

The scope of the assessment is limited to the point source combustion emissions to air from the Installation's emission points. Consistent with EA guidance, for SBGs fired on gas oil (diesel), the principal release of NO_x has been assessed.

The objective of the study is to assess the impact of NO_x emissions against the relevant Air Quality Standards for nitrogen dioxide (NO_2) for the protection of human health and the relevant Critical Levels (for NO_x) and Critical Loads (for nitrogen and acid deposition) for the protection of designated ecological receptors.

There are no changes proposed at TN and the impacts associated with the current TN arrangement and surrounding locale have been previously reported (SLR Report Reference: 416.04438.00031, Version No: 3.0, December 2021).

Given the above, this AERA report has focused on the presentation of impacts associated with TS as this is where the alterations are proposed, in addition to cumulative impacts of TS with TN.

2.0 RELEVANT GUIDANCE AND ENVIRONMENTAL BENCHMARKS

2.1 Environmental Permitting Regulations

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

2.1.1 AERA Guidance

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

2.1.2 Data Centre FAQ Guidance

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

Also of relevance is the EA's 'Guidance on dispersion modelling for oxides of nitrogen assessment from specified generator'[3]. The guidance proposes methods for statistical analysis of impacts from short-term operation (e.g. using hypergeometric probability distribution) and a framework for acceptable probabilities of impact. The methodology is detailed further in Section 3.0 below.

2.2 Air Quality Legislation and Guidance

2.2.1 Air Quality Standards Regulations

The Air Quality Standards Regulations 2010[4] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC), and the Fourth Daughter Directive (2004/107/EC) within UK legislation, in order to align and mirror European obligations. The regulations set Limit Values, Target Values, and Objectives for the protection of human health and the environment. Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[5] was introduced to mirror revisions to supporting EU legislation.

2.2.2 US AEGLs

Acute Exposure Guideline Levels (AEGLs) represent short-term exposure limits for toxic airborne chemicals and have been established for nitrogen dioxide (NO_2). AEGL values are developed by the National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances, which is a US federal advisory committee. The AEGL-1 for NO_2 has been considered where appropriate, based upon the EA's 'Data Centre FAQ Headline Approach'.

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit.
[2] Environment Agency, 'Data Centre FAQ Headline Approach', Data Centre FAQ DRAFT version 21.0 to TechUK for Discussion 15/11/22.
[3] https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment.
[4] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.
[5] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument No. 1313, The Stationary Office Limited.

2.2.3 Air Quality Strategy

The latest AQS for England was published in 2023[6]. The AQS provides the delivery framework for air quality management across England for local authorities and summarises the air quality standards and objectives operable within England for the protection of public health and the environment.

The ambient air quality objectives of relevance to human receptors in this assessment are provided in Table 2-1. The AQS objectives apply at locations where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period (defined as 'relevant exposure'). Table 2-2 provides an indication of those locations.

2.2.4 Applied AQALs

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

Table 2-1
Applied AQALs

Pollutant	AQAL (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions per year)
	956	1-hour mean (US AEGL-1)

Table 2-2
Human Health Relevant Exposure

AQAL Averaging Period	AQALs Should Apply At	AQALs Should Not Apply At
Annual mean	Building facades of residential properties, schools, hospitals etc.	Facades of offices or other places of work Hotels Gardens of residences Kerbside sites
1-hour mean	As above together with hotels, gardens of residential properties, kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.2.5 Local Air Quality Management

Part IV of the Environment Act 1995 requires local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to Review and Assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective. Local authorities therefore have formal powers to control air quality through a combination of LAQM and through application of wider planning policies.

The Mayor of London has published technical guidance for use by London Boroughs in their LAQM review and assessment work[7] – referred to as LLAQM.TG(19) throughout this report.

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[6] Air Quality Strategy: Framework for Local Authority Delivery, Defra. April 2023.
[7] Mayor of London, London Local Air Quality Management (LLAQM), Technical Guidance 2019 (LLAQM.TG(19)).

2.3 Protection of Nature Conservation Sites

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

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

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

2.3.1 Critical Levels (CLe)

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

Table 2-3
Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	CLe (µg/m^3)	Habitat and Averaging Period
NO_x	30	Annual mean (all ecosystems)
	200 [A]	Daily mean (all ecosystems)
Sulphur dioxide (SO_2)	10	Annual mean (where lichens or bryophytes are present)
Ozone (O_3)	6,000	AOT40 (calculated from 1-hour values), annual

Table note:
[A] 200µg/m^3 is accepted as the daily mean CLe where the baseline ozone concentrations are below the AOT40 CLe and SO_2 is below the lower CLe of 10µg/m^3 (as above).

2.3.2 Critical Loads (CLo)

CLo are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. CLo are set for the deposition of various substances to sensitive ecosystems. In relation to combustion emissions CLo for acidification are relevant which can occur via both wet and dry deposition; however, on a local scale only dry (direct deposition) is considered significant. Deposition of nitrogen can cause eutrophication and acidification; the relevant CLo are presented in Section 4.2.2.

3.0 ASSESSMENT METHODOLOGY

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

3.1 Dispersion Modelling

3.1.1 Dispersion Model

For this assessment the United States (US) American Meteorological Society and Environmental Protection Agency Regulatory Model (AERMOD v11.0) dispersion model has been applied; this model is widely used and accepted by the EA for undertaking such assessments and its predictions have been validated against real-time monitoring data by the US Environmental Protection Agency (EPA).

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

3.1.2 Model Domain / Receptors

The modelling of discrete sensitive receptor locations as described in Section 4.2 was undertaken to assess long-term impacts and the probability of short-term impacts at relevant exposure locations.

3.1.3 Topography

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

AERMOD utilises digital elevation terrain data to determine the impact of topography on dispersion from a source. Topography was incorporated within the modelling using UK National Transfer Format (NTF) terrain data. Data was processed by the AERMAP function within AERMOD to calculate terrain heights (see Figure 4-5).

3.1.4 Building Downwash

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

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Buildings, input to the model are represented in Figure 3-1.

[8] U.S. Environmental Protection Agency AERMOD Model Formulation and Evaluation EPA-454/R-18-003 (April, 2018).

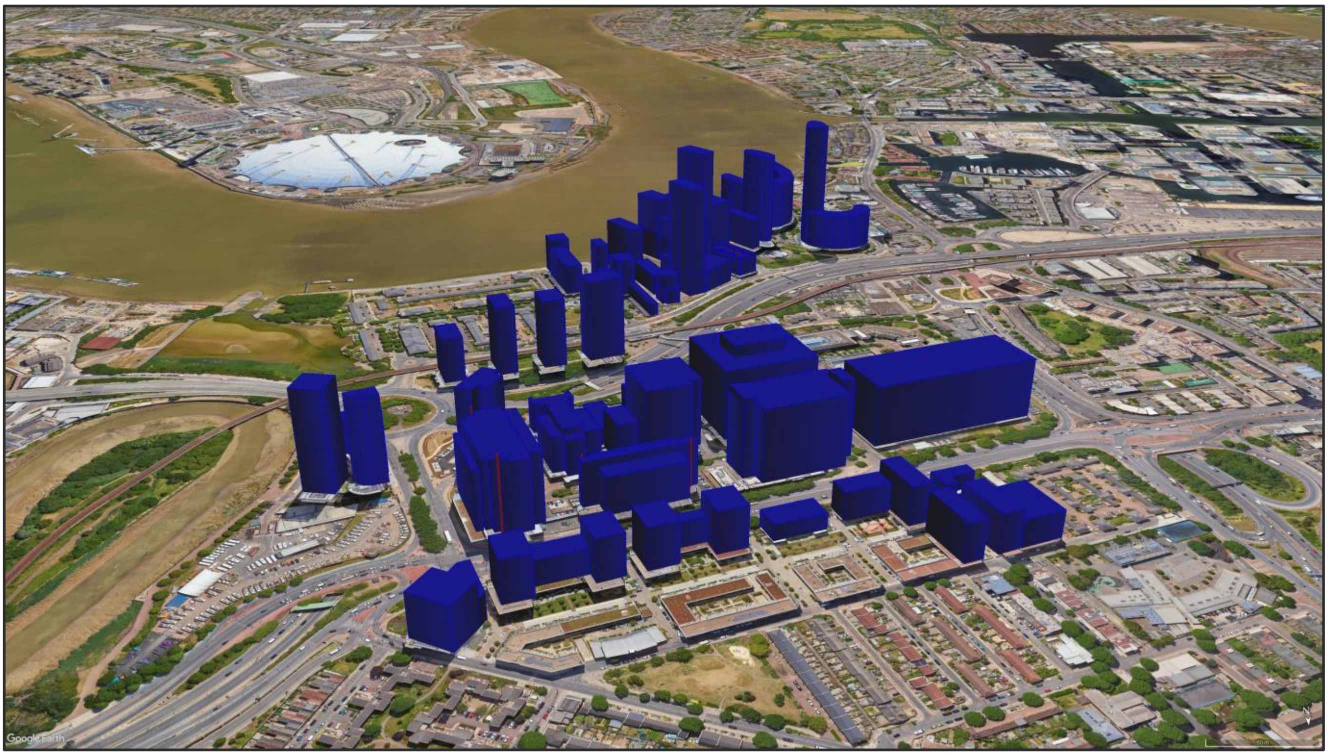

Figure 3-1
Modelled Buildings

3.1.5 Dispersion Coefficients

The 'urban' option for dispersion coefficients was selected in accordance with AERMOD guidance[9].

3.1.6 Meteorological Data and Preparation

It was concluded that London City Airport station, located approximately 4.8km to the east of the Installation, would provide the most complete and representative data set for purposes of this assessment. A windrose is presented in Figure 4-4.

The meteorological data (covering the period 2015 to 2019 inclusive) was obtained in .met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor. Details specific to the meteorological station location were used to define surface roughness, albedo and bowen ratio in the conversion (see Table 3-1).

Table 3-1
Applied Surface Characteristics

Zone (start)	Zone (end)	Albedo	Bowen Ratio	Surface Roughness (m) [A]
60	230	0.17	0.93	1.0
230	60			1.0
Table note: [A] Default value of 1.0m defined by urban dispersion coefficient.				

[9] EPA, AERMOD Implementation Workgroup, Aermod Implementation Guide (August 3, 2015).

3.2 Assessment of Impacts on Air Quality

3.2.1 Treatment of Model Output

The assessment of impacts against the AQALs as defined in Section 2.2 was undertaken using model output as described in Table 3-2 below.

With respect to NO_x emissions the EA Air Quality Modelling and Assessment Unit (AQMAU) guidance[10] on conversion ratio for NO_x and NO_2 has been followed, i.e. a worst-case scenario has been applied in that 70% of NO_x is present as NO_2 in relation to long term impacts and 35% of NO_x is present as NO_2 in relation to short-term impacts.

Table 3-2
Model Outputs

AQAL being assessed	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
NO_2 1-hour mean. Not to be exceeded more than 18 times a calendar year	99.79%ile of 1-hour means. PC factored for 35% of NO_x present as NO_2. Threshold violation file (threshold set at 200µg/m³ minus 2x annual mean background, converted to NO_x assuming 35% of NO_x present as NO_2) counts number of hours per annum exceeding threshold.	Probability of exceedance calculated using hypergeometric distribution.
US AEGL-1: NO_2 1-hour mean	PC factored for 35% of NO_x present as NO_2. Threshold violation file (threshold set at 956µg/m³ minus 2x annual mean background, converted to NO_x assuming 35% of NO_x present as NO_2) counts number of hours per annum exceeding threshold.	Probability of exceedance calculated using hypergeometric distribution.
NO_2 Annual Mean	Annual mean from 5 met. years (factored for operational hours) PC factored for 70% of NO_x present as NO_2	PC + annual mean background
NO_x Daily Mean CLe	Maximum 24-hour mean from 5 met. Years Factored to length of test where appropriate	PC + 2 x annual mean background
NO_x Annual Mean CLe/CLo	Annual mean from 5 met. years (factored for operational hours)	PC + annual mean background

3.2.2 Statistical Analysis of Short-Term Impacts

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

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

[10] Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for NO_x and NO_2' (no date).

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

3.2.3 Assessment of Annual Mean Impact and Significance

In accordance with the EA's AERA guidance, the impact is considered to be insignificant or negligible if the long-term process contribution is <1% of the long term AQAL. For process contributions that cannot be considered insignificant further assessment has been undertaken and the Predicted Environmental Concentration (PEC: PC + existing background pollutant concentration) determined for comparison as a percentage of the relevant AQAL.

3.3 Assessment of Impacts on Vegetation and Ecosystems

3.3.1 Calculation of Contribution to Critical Loads

Deposition rates were calculated using empirical methods recommended by the EA AQTAG06[11]. Dry deposition flux was calculated using the following equation:

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

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow, and is not considered significant over short distances (AQTAG06) compared with dry deposition and therefore for the purposes of this assessment, wet deposition has not been considered consistent with QTAG06.

The applied deposition velocities for the relevant chemical species are as shown in Table 3-3.

Table 3-3
Applied Deposition Velocities

Chemical Species	Recommended deposition velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

The predicted deposition rates were converted from µg/m^2/s to units of nitrogen deposition and acid equivalent deposition as detailed in Table 3-4.

Table 3-4
Applied Deposition Conversion Factors

	Conversion from NO_2 µg/m^2/s to:	Factor
N deposition	N kg/ha/year	95.9
Acid deposition	k_{eq}/ha/year	6.84

Calculation of PC as a percentage of Acid CLo Function

The calculation of the process contribution of N to the acid CLo function has been carried out according to the guidance on Air Pollution Information System (APIS), which is as follows:

"The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional

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

nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying affects of sulphur from the process need to be considered:

Where PEC N Deposition < CLminN

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

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

Where PEC N Deposition > CLminN

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

3.3.2 Assessment of Impact and Significance

In addition to the AERA guidance, the EA's Operational Instruction 66_12[12] details how the air quality impacts on ecological sites should be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, 'no likely damage' for SSSIs and 'no significant pollution' for other sites, as follows:

- PC <1% long-term CLe and/or CLo or that the PEC <70% long-term CLe and/or CLo for European sites and SSSIs;
- PC <10% short-term CLe for NOx (if applicable) for European sites and SSSIs;
- PC <100% long-term CLe and/or CLo other conservation sites; and
- PC <100% short-term CLe for NOx (if applicable) for other conservation sites.

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with EA's Operational Instruction 67_12[13]. This can require the consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors (such as the water table).

The guidance provides the following further criteria:

- if the PEC does not exceed 100% of the appropriate limit it can be assumed there will be no adverse effect;
- if the background is below the limit, but a small PC leads to an exceedance – decision based on local considerations;
- if the background is currently above the limit and the additional PC will cause a small increase – decision based on local considerations;
- if the background is below the limit, but a significant PC leads to an exceedance – cannot conclude no adverse effect; and
- if the background is currently above the limit and the additional PC is large – cannot conclude no adverse effect.

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

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

4.0 BASELINE ENVIRONMENT

4.1 Baseline Air Quality

Monitoring data collected prior to the COVID-19 pandemic (i.e. pre-2020) has been used to characterise the baseline environment, as pollutant concentrations monitored during 2020 and 2021 are expected to be atypical and not representative of the local environment.

4.1.1 LAQM Review and Assessment

The Installation is located within the administrative boundary of the London Borough of Tower Hamlets (LBoTH). In December 2000, the whole borough was declared an AQMA for the annual mean NO_2 AQAL, known as the 'Tower Hamlets AQMA'.

The administrative boundaries of the London Borough of Newham and the Royal Borough of Greenwich are located within 200m of the Installation. As with LBoTH, the whole boroughs are declared as AQMAs for the annual mean NO_2 AQAL.

4.1.2 Review of Air Quality Monitoring

The Air Quality Annual Status Reports for the three boroughs[14,15,16] containing monitoring data not impacted by the COVID-19 pandemic have been reviewed.

The results from the closest monitors to the Installation are presented in Table 4-1. Results from background automatic monitors are also presented. The locations of the monitors relative to Installation are displayed in Figure 4-1.

Table 4-1
LAQM Monitors: Results

ID	Site Type	Approx. Distance to Installation (m)	Annual Mean NO_2 Concentration ($\mu g/m^3$)				
			2015	2016	2017	2018	2019
Automatic							
TH001	Background	2,050	26	25	26	23	24
TH002	Background	3,800	33	32	32	26	24
TH004	Roadside	510	58	59	56	51	47
NM3	Background	1,060	30	33	30	28	28
Diffusion Tube							
72	Kerbside	435	41	39	40	39	38
73	Kerbside	140	36	38	40	32	31
74	Kerbside	350	-	-	-	64	71
76	Kerbside	735	51	48	49	45	39
84	Roadside	325	52	48	52	44	39
85	Kerbside	120	48	48	48	45	38
86	Kerbside	180	33	34	33	30	28

[14] London Borough of Tower Hamlets Air Quality Annual Status Report for 2019, May 2020.
[15] London Borough of Newham Air Quality Annual Status Report for 2019, May 2020.
[16] Royal Borough of Greenwich Air Quality Annual Status Report for 2019, May 2020.

ID	Site Type	Approx. Distance to Installation (m)	Annual Mean NO_2 Concentration (µg/m^3)				
			2015	2016	2017	2018	2019
20	Roadside	670	48	47	56	58	57
ID	**Site Type**	**Approx. Distance to Installation (m)**	**Number of Hourly NO_2 Means >200µg/m^3**				
			2015	**2016**	**2017**	**2018**	**2019**
TH001	Background	2,050	0	0	0	0	0
TH002	Background	3,800	0	0	24	1	0
TH004	Roadside	510	0	9	0	0	0
NM3	Background	1,060	0	0	13	0	0

As noted within Table 4-1, annual mean NO_2 concentrations at or above the AQAL (40µg/m^3) have been recorded at several of the monitors closest to the Installation during the period 2015-2019, except at monitor 86.

When comparing 2015 annual mean monitored concentrations with 2019, there is a notable downward trend, with 2019 exhibiting lower concentrations at all monitors, except at monitor 74 and 20.

Annual mean NO_2 concentrations at the three automatic background monitors (TH001, TH002 and NM3) have remained below the AQAL for the period presented (2015-2019). In addition, 2019 concentrations were 'well below' the AQAL (i.e. <75%).

4.1.3 Defra Mapped Background Concentrations

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution which is routinely used to support LAQM requirements and air quality assessments. The data sets include annual average concentration estimates for NO_2 using a reference year of 2018 (the year in which comparisons between modelled and monitoring are made), which can be project to future years.

The 2019 (base year) and 2023 (current year) Defra projected annual mean NO_2 background concentrations for the grid squares covering the Installation and human receptor locations are presented in Table 4-2.

Table 4-2
Defra Modelled Background Concentrations

Grid Square (X, Y)	Year	Annual Mean NO_2 Background Concentration (µg/m^3)
538500, 180500	2019	39.8
	2023	33.1
538500, 181500	2019	35.5
	2023	29.0
539500, 181500	2019	36.5
	2023	29.5

4.1.4 Application of Baseline Data

The 2023 Defra mapped background concentrations were applied to human receptors contained in each applicable grid square. The maximum concentration (33.1µg/m^3) has been utilised in the threshold violation files for assessment of the probability of exceedance of the 1-hour AQAL and AEGL-1.

4.2 Sensitive Receptors

4.2.1 Human Receptors

A number of discrete sensitive receptors, listed in Table 4-3 and shown in Figure 4-2 and Figure 4-3, comprising the closest relevant exposure locations have been selected. This included the consented mixed-use development adjacent to TS (LBoTH planning application reference: PA/20/02509/A1) represented as HR37 'Hadley Application'.

The receptor locations were modelled at 1.5m above ground level (if relevant), and at subsequent intervals representative of floor levels where relevant. A total of 1053 individual human receptor locations were modelled.

Table 4-3
Modelled Human Receptor Locations

Report Ref.	Model Ref.	Description	Flagpole Heights (Min. to Max. m Above Ground Level)	Relevant Averaging Period
HR1	DR1-2	Aberfeldy E14	1.5 – 18.0	All (Long and Short-term)
HR2	DR3-4	Waterman's House	1.5 – 27.0	All (Long and Short-term)
HR3	DR5-6	Sailors House	1.5 – 27.0	All (Long and Short-term)
HR4	DR7-10	Glass Blower's House	1.5 – 27.0	All (Long and Short-term)
HR5	DR11-12	Julius House	1.5 – 12.0	All (Long and Short-term)
HR6	DR13-14	Jones House	1.5 – 12.0	All (Long and Short-term)
HR7	DR15-16, DR1043	Culloden School	1.5 – 6.0	All (Long and Short-term)
HR8	DR17-22, DR581-603	Elektron Tower	1.5 – 67.5	All (Long and Short-term)
HR9	DR23-30, DR604-624	Proton Tower	1.5 – 70.0	All (Long and Short-term)
HR10	DR31-37	Neutron Tower	1.5 – 60.0	All (Long and Short-term)
HR11	DR38-43	Switch Tower	1.5 – 60.0	All (Long and Short-term)
HR12	DR44-52, DR1052	Saffron Avenue (amenity space)	1.5	Short-term only
HR13	DR53	Train Station	1.5	Short-term only
HR14	DR54-109	Travel Lodge (new)	1.5 – 60.0	Short-term only
HR15	DR110-172	Orchard Wharf (new)	1.5 – 80.0	All (Long and Short-term)
HR16	DR173-192	Radisson Blu Edwardian	4.5 – 31.5	Short-term only
HR17	DR193-258	Ontario Tower	1.5 – 97.5	All (Long and Short-term)
HR18	DR259-312	Radisson Blu Edwardian New Providence Wharf	1.5 – 52.5	Short-term only
HR19	DR313-383	Charrington Tower	1.5 – 133.5	All (Long and Short-term)
HR20	DR384-401	Michigan Building	1.5 – 25.5	All (Long and Short-term)
HR21	DR402-426	Streamlight Tower	1.5 – 73.5	All (Long and Short-term)
HR22	DR427-452	Royal Captain Court	1.5 – 76.5	All (Long and Short-term)
HR23	DR453-477	Prestons Road	1.5 – 73.5	All (Long and Short-term)

Report Ref.	Model Ref.	Description	Flagpole Heights (Min. to Max. m Above Ground Level)	Relevant Averaging Period
HR24	DR478-481	Naval House	1.5 – 10.5	All (Long and Short-term)
HR25	DR482-485	Pumping House	1.5 – 10.5	All (Long and Short-term)
HR26	DR486-493	Newport Avenue	1.5 – 10.5	All (Long and Short-term)
HR27	DR494-505	Wingfield Court	1.5 – 34.5	All (Long and Short-term)
HR28	DR506-517	Longitude House	1.5 – 34.5	All (Long and Short-term)
HR29	DR518-529	Wotton Court	1.5 – 34.5	All (Long and Short-term)
HR30	DR530-539	Studley Court	1.5 – 28.5	All (Long and Short-term)
HR31	DR540-548	Explorers Court	1.5 – 25.5	All (Long and Short-term)
HR32	DR549-552	Sexton Court	1.5 – 10.5	All (Long and Short-term)
HR33	DR553-560	Bartholomew Court	1.5 – 22.5	All (Long and Short-term)
HR34	DR561-565	Bridge Court	1.5 – 13.5	All (Long and Short-term)
HR35	DR566-570	Settlers Court	1.5 – 13.5	All (Long and Short-term)
HR36	DR571-580	Adventurers Court	1.5 – 28.5	All (Long and Short-term)
HR37	DR625-1018	Hadley Application	1.5 – 133.5	All (Long and Short-term)
HR38	DR1019-1020	Artisans House	1.5 – 27.0	All (Long and Short-term)
HR39	DR1021-1022	Traders House	1.5 – 27.0	All (Long and Short-term)
HR40	DR1023-1024	Landing Waters House	1.5 – 27.0	All (Long and Short-term)
HR41	DR1025-1026	Chain Makers House	1.5 – 12.0	All (Long and Short-term)
HR42	DR1027-1028	Drum Makers House	1.5 – 12.0	All (Long and Short-term)
HR43	DR1029-1030	Accra Close	1.5 – 12.0	All (Long and Short-term)
HR44	DR1031	DLR Station Blackwall	1.5	Short-term only
HR45	DR1032	DLR Station East India	1.5	Short-term only
HR46	DR1033	Virginia Quay Park	1.5	Short-term only
HR47	DR1034	Outdoor Eating	1.5	Short-term only
HR48	DR1035-1036	Flour Millers House	1.5 – 30.0	All (Long and Short-term)
HR49	DR1037-1038	Franklin House	1.5 – 12.0	All (Long and Short-term)
HR50	DR1039-1040	Wharf View Court	1.5 – 12.0	All (Long and Short-term)
HR51	DR1041-1042	Aberfeldy Street	1.5 – 30.0	All (Long and Short-term)
HR52	DR1044	Braithwaite Park	1.5	Short-term only
HR53	DR1045	Bow Creek Ecology Park	1.5	Short-term only
HR54	DR1046-1047	Woolmore Primary School	1.5 – 12.0	All (Long and Short-term)
HR55	DR1048	Robin Hood Lane	1.5	All (Long and Short-term)
HR56	DR1049	Robin Hood Gardens	1.5	Short-term only
HR57	DR1050	Jessop Building Playpark	1.5	Short-term only

Report Ref.	Model Ref.	Description	Flagpole Heights (Min. to Max. m Above Ground Level)	Relevant Averaging Period
HR58	DR1051	Fortrose Close Park	1.5	Short-term only
HR59	DR1053	Athol Square	1.5	All (Long and Short-term)

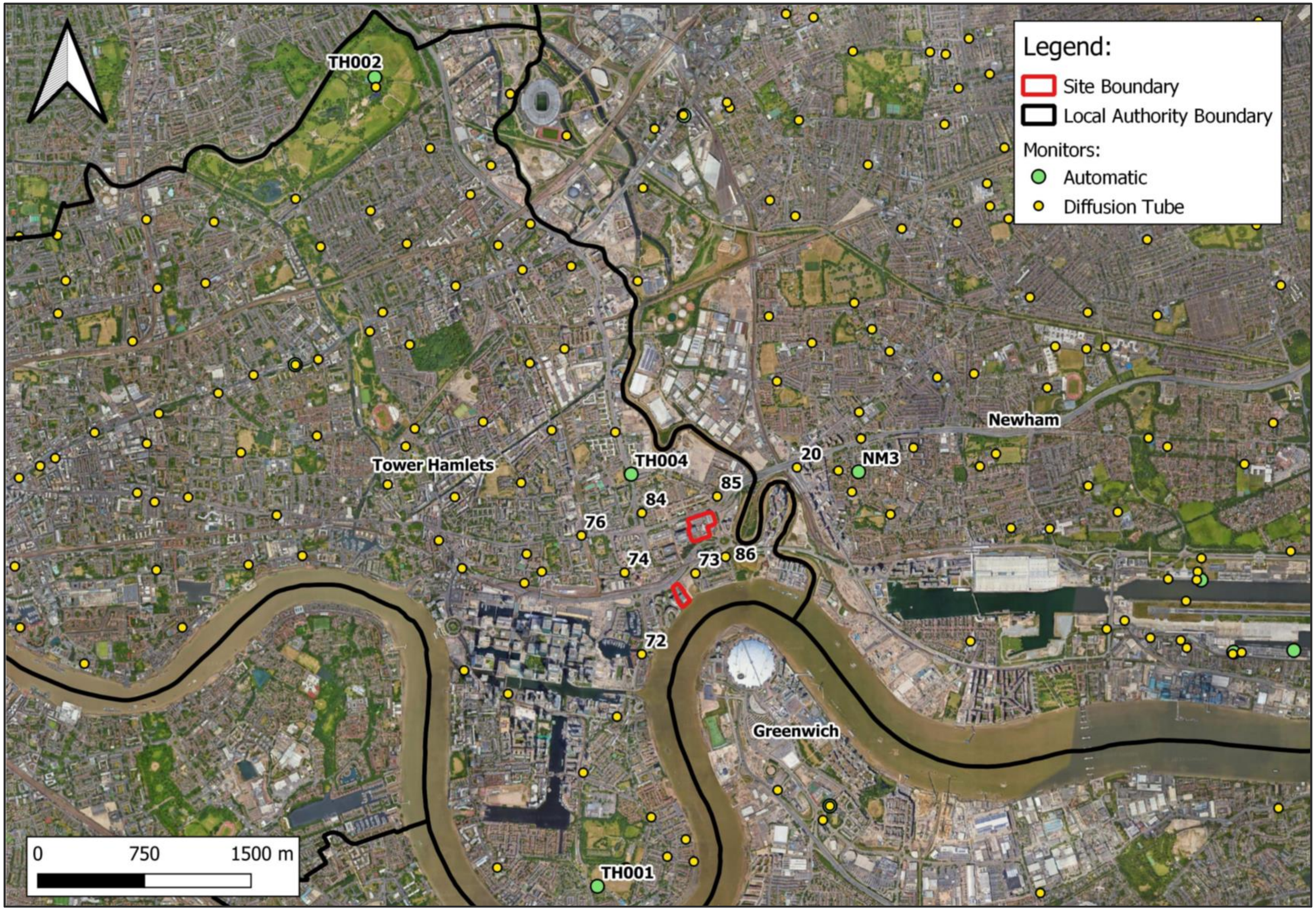

Figure 4-1
Site Setting

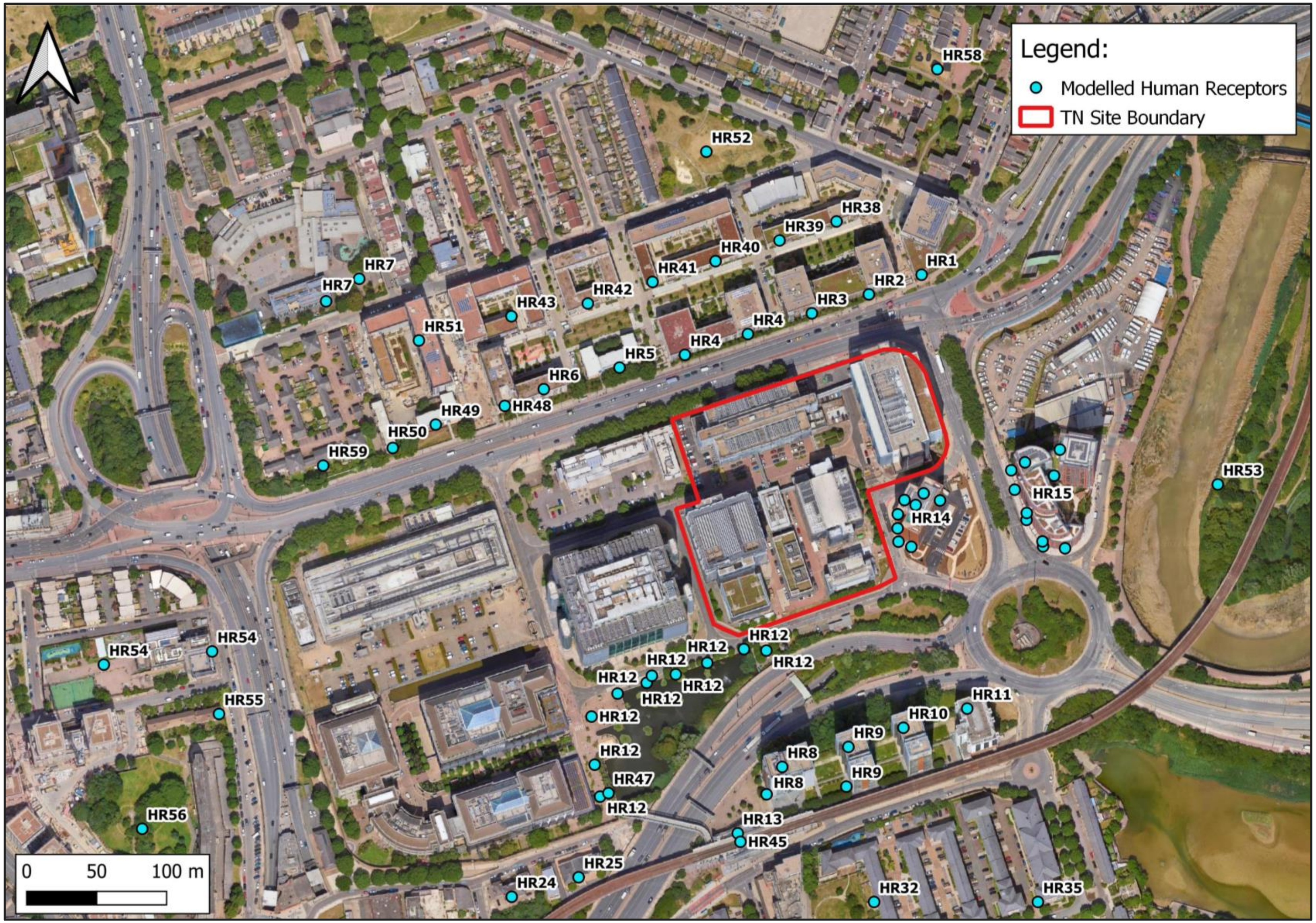

Figure 4-2
Modelled Human Receptors (Telehouse North)

Figure 4-3
Modelled Human Receptors (Telehouse South)

SLR

4.2.2 Ecological Receptors

Designated sites within the set screening distance are presented in Table 4-4. These sites have been informed by the Nature and Heritage Conservation Screening Report received from the EA.

Table 4-4
Ecological Receptors

Interest Status	Site (Designation)	Ref.	Approx. Distance from Closest Installation Boundary (m)
European	Lee Valley (SPA and Ramsar)	ER1	7,800
European	Epping Forest (SAC)	ER2	7,000
Local	Cameron Community Garden (SINC / LWS)	ER3	1,420
	Poplar Dock (SINC / LWS)	ER4	255
	Blackwall Basin (SINC / LWS)	ER5	365
	Millwall and West India Docks (SINC / LWS)	ER6	625
	Millwall Park (SINC / LWS)	ER7	1,855
	Mudchute Park Farm (LNR and SINC) [(A)]	ER8	1,500
	East India Dock Basin (SINC / LWS)	ER9	145
	Saffron Avenue Pond (SINC / LWS)	ER10	10
	Robin Hood Gardens (SINC / LWS)	ER11	270
	Cyril Jackson School Nature Area (SINC / LWS)	ER12	1,635
	St Anne's Churchyard, Limehouse (SINC / LWS)	ER13	1,800
	London's Canals (SINC / LWS)	ER14	1,115
	Mile End Park (SINC / LWS)	ER15	1,855
	Bromley-by-Bow War Memorial Wood (SINC / LWS)	ER16	1,200
	Lea Valley (SINC / LWS)	ER17	1,180
	River Thames and tidal tributaries (SINC / LWS)	ER18	<1
	Greenwich Ecology Park and Southern Park (SINC / LWS)	ER19	1,790
	Bow Creek Ecology Park (SINC / LWS)	ER20	185
	Thames Wharf (SINC / LWS)	ER21	500
	Royal Docks (SINC / LWS)	ER22	1,325
	Lyle Park (SINC / LWS)	ER23	1,930
	Fun Forest (SINC / LWS)	ER24	1,705
	Star Park (SINC / LWS)	ER25	750
	Durand's Wharf (SINC / LWS)	ER26	2,020
	Transco Rough (SINC / LWS)	ER27	1,260
	DLR Corridor (SINC / LWS)	ER28	670
	East London Cemetery (SINC / LWS)	ER29	1,650

Interest Status	Site (Designation)	Ref.	Approx. Distance from Closest Installation Boundary (m)
	DLR Corridor (SINC / LWS)	ER30	1,050
	Bow Creek/River Lea (SINC / LWS)	ER31	560
	Channelsea Island (SINC / LWS)	ER32	1,735
	The Greenway and Old Ford Nature Reserve (SINC / LWS)	ER33	1,955
	Ackroyd Drive LNR	ER34	1,915
	Tower Hamlets Cemetery Park LNR	ER35	1,960

Table note: (A) These sites fully overlap and therefore have been assessed together.

4.3 Baseline Conditions at Ecological Receptors

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

APIS, the European Environment Agency website[17], in addition to online literature sources and satellite imagery has been used to provide information on:

- identification of whether the habitats present are sensitive to effects caused by potential emissions;
- current baseline concentrations (Table 4-5);
- CLo and current deposition rates (Table 4-5 and Table 4-6); and
- baseline ozone concentrations (Table 4-7).

For locally designated ecological sites, the APIS 'Search by Location' function was utilised to obtain the above information. The NGR of maximum impact on the NO_x CLe during testing and maintenance was used as the input.

Table 4-5
NO_x, SO_2, Nitrogen Critical Loads and Current Loads

Ref.	Habitat Critical Load Class (most sensitive)	APIS NO_x Background ($\mu g/m^3$)	APIS SO_2 Background ($\mu g/m^3$)	Critical Load Applied (kgN/ha/yr)	Current Load (kgN/ha/yr)
ER1	Rich fens	37.0	2.1	15	24.6
ER2	Fagus woodland	35.9	2.1	10	40.7
ER3	Low and medium altitude hay meadows	46.5	2.5	20	22.8
ER4	Broadleaved deciduous woodland	69.6	2.5	10	42.1
ER5	Low and medium altitude hay meadows	69.6	2.5	20	22.8
ER6	Low and medium altitude hay meadows	57.4	2.5	20	22.8
ER7	Low and medium altitude hay meadows	39.5	2.3	20	20.8
ER8	Broadleaved deciduous woodland	59.6	2.3	10	38.7
ER9	Low and medium altitude hay meadows	69.6	2.5	20	22.8

[17] Air quality statistics calculated by the EEA (F), accessed: http://aidef.apps.eea.europa.eu.

Ref.	Habitat Critical Load Class (most sensitive)	APIS NO_x Background ($\mu g/m^3$)	APIS SO_2 Background ($\mu g/m^3$)	Critical Load Applied (kgN/ha/yr)	Current Load (kgN/ha/yr)
ER10	Broadleaved deciduous woodland	69.6	2.5	10	42.1
ER11	Low and medium altitude hay meadows	69.6	2.5	20	22.8
ER12	Low and medium altitude hay meadows	50.1	2.5	20	22.8
ER13	Broadleaved deciduous woodland	49.5	2.5	10	42.1
ER14	Low and medium altitude hay meadows	46.5	2.5	20	22.8
ER15	Low and medium altitude hay meadows	49.5	2.5	20	22.8
ER16	Broadleaved deciduous woodland	47.7	2.5	10	42.1
ER17	Low and medium altitude hay meadows	47.7	2.5	20	22.8
ER18	Low and medium altitude hay meadows	69.6	2.5	20	22.8
ER19	Broadleaved deciduous woodland	48.4	2.3	10	38.7
ER20	Broadleaved deciduous woodland	60.1	2.5	10	42.1
ER21	Low and medium altitude hay meadows	51.7	2.5	20	22.8
ER22	Low and medium altitude hay meadows	43.2	2.8	20	20.2
ER23	Low and medium altitude hay meadows	40.6	2.1	20	19.6
ER24	Broadleaved deciduous woodland	48.6	2.8	10	37.7
ER25	Low and medium altitude hay meadows	60.1	2.5	20	22.8
ER26	Low and medium altitude hay meadows	41.6	2.3	20	20.8
ER27	Broadleaved deciduous woodland	47.7	2.5	10	42.1
ER28	Low and medium altitude hay meadows	60.1	2.5	20	22.8
ER29	Low and medium altitude hay meadows	42.4	2.5	20	22.8
ER30	Low and medium altitude hay meadows	51.7	2.5	20	22.8
ER31	Low and medium altitude hay meadows	58.5	2.5	20	22.8
ER32	Broadleaved deciduous woodland	47.7	2.5	10	42.1
ER33	Low and medium altitude hay meadows	42.2	2.8	20	20.2
ER34	Low and medium altitude hay meadows	49.5	2.5	20	22.8
ER35	Broadleaved deciduous woodland	47.8	2.5	10	42.1

Table 4-6
Acid Critical Load Functions and Current Loads

Ref.	Habitat Critical Load Class (most sensitive)	Critical Load Function (kg_{eq}/ha/yr)			Current Load (kg_{eq}/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
ER1	Calcareous grassland	4.0	1.1	5.1	1.7	0.2
ER2	Unmanaged Broadleafed/Coniferous Woodland	1.5	0.1	1.7	2.9	0.3
ER3	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER4	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	3.0	0.3

Ref.	Habitat Critical Load Class (most sensitive)	Critical Load Function (kg_{eq}/ha/yr)			Current Load (kg_{eq}/ha/yr)	
		CLmaxS	CLminN	CLmaxN	N	S
ER5	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER6	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER7	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.5	0.2
ER8	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	2.8	0.2
ER9	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER10	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	3.0	0.3
ER11	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER12	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER13	Broadleafed/Coniferous unmanaged woodland	1.7	0.4	2.1	3.0	0.3
ER14	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER15	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER16	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	3.0	0.3
ER17	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER18	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER19	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	2.8	0.2
ER20	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	3.0	0.3
ER21	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER22	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.5	0.2
ER23	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.4	0.2
ER24	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	2.7	0.2
ER25	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER26	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.5	0.2
ER27	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	3.0	0.3
ER28	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER29	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER30	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER31	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER32	Broadleafed/Coniferous unmanaged woodland	8.3	0.4	8.7	3.0	0.3
ER33	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.5	0.2
ER34	Calcareous grassland (using base cation)	4.0	1.1	5.1	1.6	0.2
ER35	Broadleafed/Coniferous unmanaged woodland	1.7	0.4	2.1	3.0	0.3

Table 4-7
Baseline Ozone Concentrations

EU Site ID	Site Name	Approx. Distance to Installation (km)	AOT40 Annual (µg/m³).h				
			2015	2016	2017	2018	2019
GB0586A	London Eltham	7.8	2,327	2,096	2,370	9,206	3,688
GB0566A	London Bloomsbury	8.7	505	379	914	4,077	930
GB0682A	London Marylebone Road	10.5	0	30	33	359	0
GB1024A	London Haringey Priory Park South	11.7	3,032	2,811	3,259	9,635	3,685
GB0620A	London N. Kensington	14.5	2,552	2,786	2,992	9,936	4,583
		CLe (µg/m³)	***6,000***				

As displayed in Table 4-5, the maximum annual mean SO_2 concentrations at all the modelled ecological designations are well below SO_2 CLe of 10µg/m³.

Table 4-7 presents a summary of the baseline ozone concentrations (annual AOT40 concentrations) at the five recording stations closest to the Installation. For the period 2015-2019, annual AOT40 concentrations have been below the CLe (6,000µg/m³), except at London Eltham, London Haringey Priory Park South and London N. Kensington during 2018. However, 2018 appears to be an anomaly when compared to the other years and therefore in general, it is likely that baseline ozone concentrations are below the CLe. Utilising this, it can be inferred that baseline ozone concentrations are likely to be comparable at the Installation and therefore also below the CLe.

Given the above, SO_2 and ozone concentrations at the Installation are not considered to be high or above the CLe. Therefore, in line with the AERA guidance, it is considered appropriate to apply the 24-hour mean CLe of 200µg/m³ in the assessment.

4.4 Meteorological Conditions

A windrose for London City Airport station for the 5-year period (2015 to 2019), providing the frequency of wind speed and direction, is presented in Figure 4-4. The windrose shows winds from the south-west are most frequent with winds from the north and south-east least frequent.

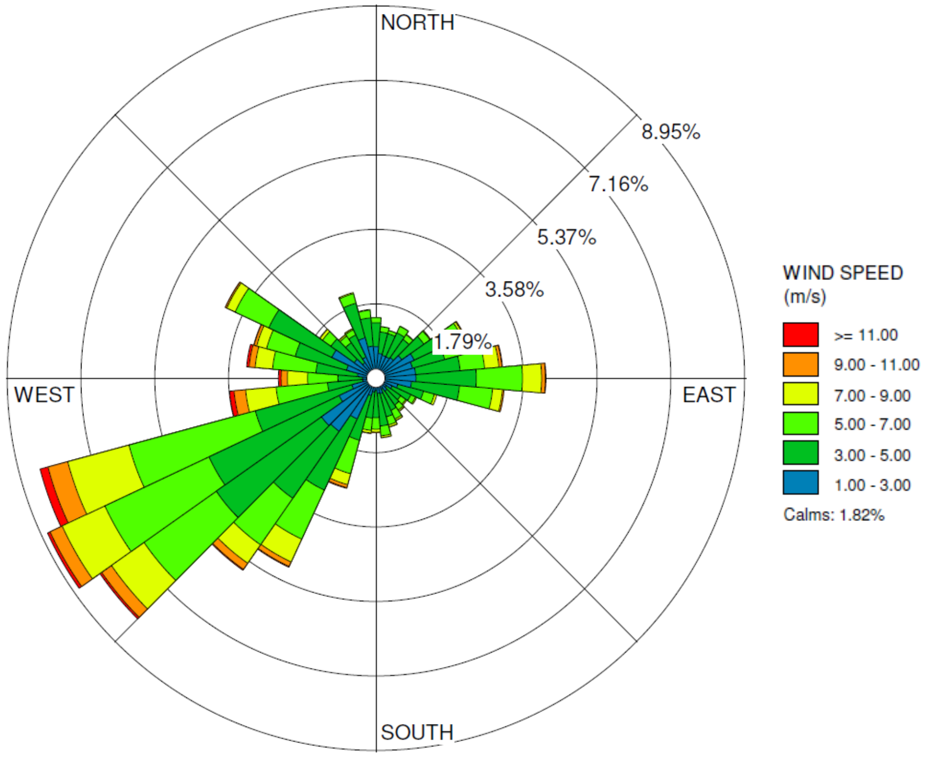

Figure 4-4
Windrose, London City Airport (2015-2019)

4.5 Topography

The Installation lies at approximately 5-10m AOD. The topography in the surrounding area, within a 2km radius, is relatively flat with the River Thames directly to the south of the Installation.

The topography is considered unlikely to have a significant effect on the dispersion of emissions from the SBGs; however, it has been included within the dispersion model for receptor heights and is displayed in Figure 4-5.

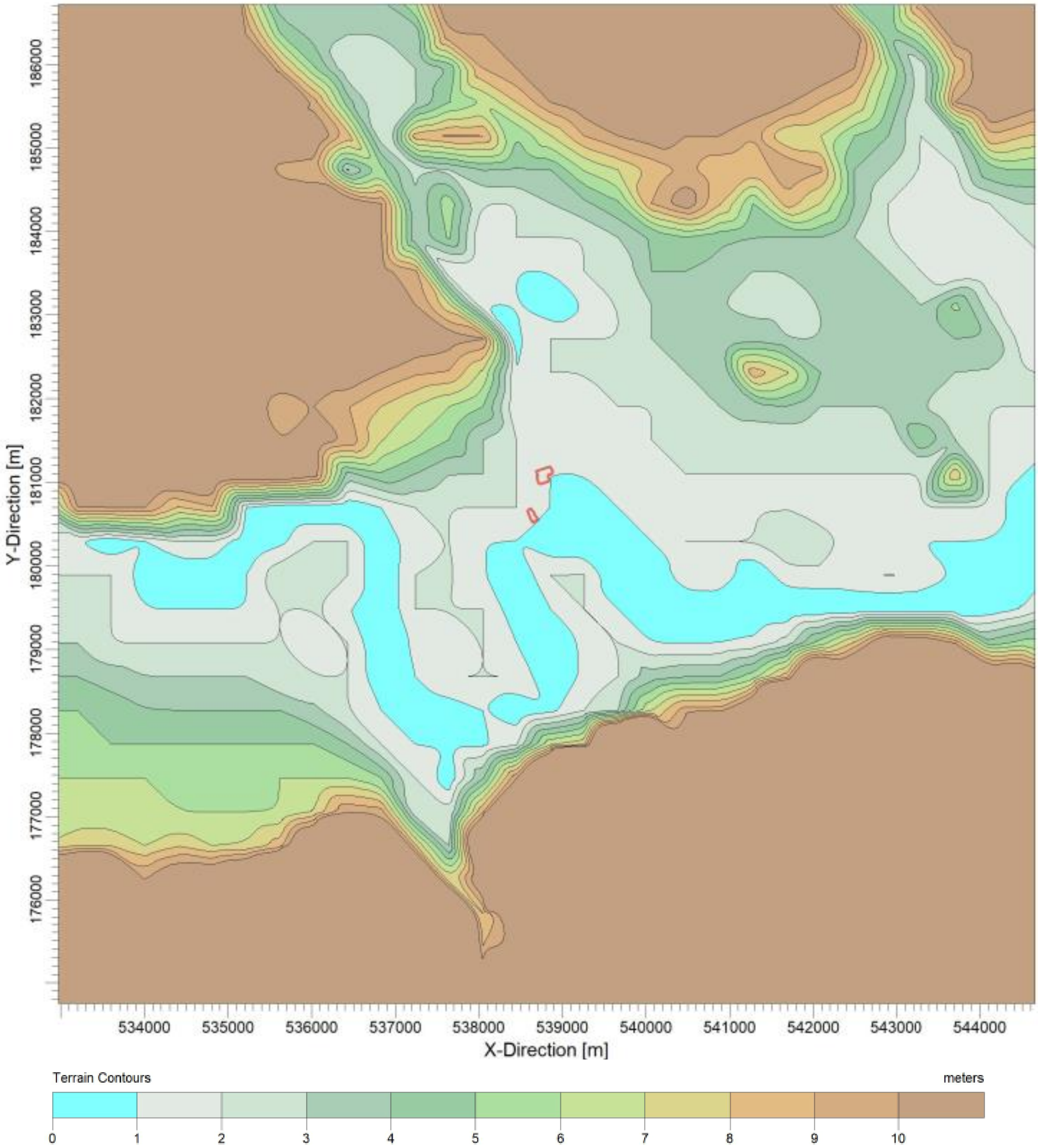

Figure 4-5
Surrounding Topography

5.0 EMISSIONS TO ATMOSPHERE

5.1 Emission Points

The emission points to air comprise exhausts associated with 27 containerised diesel SBGs in TN, and 10 SBGs in TS.

5.2 Operating Scenarios

The operating scenarios at the Installation include the following:

- Routine Maintenance Schedule Operations – the predictable, managed testing and maintenance activity for the standby plant (Maintenance Schedule Model, MSM); and
- Emergency Outage Operations – the unpredictable emergency grid outage any time during the year requiring the maximum plant to operate for the required outage duration (Outage Model, OM).

5.2.1 MSM

The testing and maintenance schedule for TN is presented in Table 5-1. The SBGs within each building are not necessarily tested concurrently (e.g. UPS wrap around maintenance involves 2 SBGs at once). However, for North, North2 and West buildings it was assumed that all SBGs operate concurrently in each test. The representation of the testing and maintenance schedule was further refined for East building to make this more accurate. It has been assumed that a maximum of 5 SBGs operate for 26 hours of testing, and a maximum of 2 SBGs operate for 19 hours of testing for East building – totalling 45 hours.

Table 5-1
Telehouse North: Testing and Maintenance Schedule

Event	Building (Average hours/year)			
	North	East	North2	West
3-monthly off-load testing during maintenance (maximum 1 hour per test)	4	4	4	4
UPS wrap around maintenance (frequency varies, 3 hours per test)	15	15	39	18
Part Load test (frequency varies, 2 hours per test)	18	18	2	18
Black Building test (twice per year, 4 hours per test)	8	8	8	8
Total	**45**	**45**	**53**	**48**

The testing and maintenance schedule for TS is presented in Table 5-2. The TN (and TS) buildings are not tested concurrently. During the TS schedule, all 10 SBGs are fired up for the duration of the tests.

Table 5-2
Telehouse South: Testing and Maintenance Schedule

Test	No. of SBGs Running	Hours and Occasions per year	Total Hours per year
Monthly Maintenance	10	1 hour each month	12
Quarterly Maintenance	10	6 hours, 4 times a year	24
Total			**36**

The annual and daily mean PCs have been factored for number of operational hours and longest test where appropriate.

5.2.2 OM

During an emergency outage, the maximum plant is required to operate for the outage duration i.e. the total plant minus redundancy (N+1).

In line with the IED, emergency outage operations are limited to 500 emergency hours, however this scenario is considered unrealistic. Therefore, the hypothetical outage scenario of 26 hours has been considered for an outage involving all buildings at once (i.e. TN and TS), and impacts factored accordingly.

5.3 Emission Parameters

The SBG emission characteristics applied in the modelling for TN and TS are presented in Table 5-3 and Table 5-4 respectively. These are based on manufacturer technical specification sheets and concentration measurement data.

The emissions parameters presented for TS, specifically the NO_x emission rate (g/s), account for the installation of SCR to the SBGs; which are anticipated to result in a 90% or more emission reduction.

Table 5-3
Telehouse North: Emission Characteristics

Parameter	North Building		East Building		West Building	North 2 Building	
Type (MTU model)	16V 4000	16V 396	16V 396	16V 4000	20V 4000 G23	20V 4000 G63L	20V 4000G34F (EO)
Number of SBGs	4	2	2	3	7 (+1 future)	4	2 (+2 future)
Identification (Model ID)	EP1_1 EP1_2 EP1_3 EP1_4	EP1_5 EP1_6	EP2_1 EP2_2	EP2_3 EP2_4 EP2_5	EP3_1 EP3_2 EP3_3 EP3_4 EP3_5 EP3_6 EP3_7 EP3_8 (future)	EP4_1 EP4_2 EP4_3 EP4_4	EP4_5 EP4_6 EP4_7 (future) EP4_8 (future)
Base Elevation (m AOD)	2	2	2	2	2	2	2
Stack Release Height (m)	39.1	39.1	27.3	27.3	28.5	62.0	62.0
Stack Orientation	Vertical	Vertical	Vertical	Vertical	Horizontal (3.5-3.8 Vertical)	Vertical	Vertical
Emission Temperature (K)	758	758	758	758	833	833	833
Stack Internal Diameter (m)	0.45	0.45	0.45	0.45	0.55	0.55	0.55
Velocity (m/s)	36.47	36.47	36.47	36.47	29.88	37.04	43.35
Actual Flow Rate (Am^3/s) (a)	5.80	5.80	5.80	5.80	7.10	8.80	10.3
Normalised Flow (Nm^3/s) (a)	1.06	1.06	1.06	1.06	1.18	1.47	2.30
NO_x Concentration (mg/Nm^3)	4000	4000	4000	4000	2000	2000	2000
NO_x Emission Rate (g/s) – per SBG	4.25	4.25	4.25	4.25	2.37	2.93	4.61

Table note: (a) Actual conditions of 6% water, 11.6% O_2 (wet), normalised to dry, 5% O_2, 273K.

Table 5-4
Telehouse South: Emission Characteristics

Parameter	Telehouse South
SBG Model	MTU 20V4000G94LF
Number of SBGs	10
Identification (Model ID)	NEWSBG1-10
Base Elevation (m AOD)	2
Stack Release Height (m)	20
Stack Orientation	Vertical
Emission Temperature (K)	755
Stack Internal Diameter (m)	0.8
Actual Flow (Am^3/s) [(a)]	11.9
Normalised Flow (Nm^3/s) [(a)]	2.4
Emission Velocity (m/s)	23.67
NO_x Concentration (mg/Nm^3) with SCR	236
NO_x Emission Rate (g/s) – per SBG with SCR	0.57

Table note: (a) Actual conditions of 10.7% water, 9.8% O_2 (wet), normalised to dry, 5% O_2, 273K.

6.0 RESULTS

The following sections present a summary of the results for TS MSM and cumulative results for TS with TN during an outage. Full results tables are presented in Appendix D.

6.1 Maintenance Schedule Model

6.1.1 Annual Mean NO_2 Impacts

The combined annual mean NO_2 impacts associated with the TS and TN routine testing and maintenance schedules are presented in Table D-1 of Appendix D.

The PC is <1% of the AQAL and therefore considered insignificant at the majority of receptors. The PC is >1% of the AQAL at some of the receptor locations, however the PECs are below the AQAL. No exceedances of the annual mean NO_2 AQAL are reported.

6.1.2 1-hour Mean NO_2 Impacts

TS short-term MSM impacts are presented below. TN short-term MSM impacts do not combine with TS impacts and are unchanged from those presented previously (SLR Report Reference: 416.04438.00031, Version No: 3.0, December 2021) and therefore not repeated in this report.

AQAL

Table D-2 of Appendix D presents a summary of the probability of exceedance of the 1-hour mean NO_2 AQAL during the TS routine testing and maintenance schedule.

The probability of exceedance of the 1-hour mean NO_2 AQAL is <1% at all selected modelled receptor locations and therefore considered 'highly unlikely'.

AEGL-1

Table D-3 of Appendix D presents a summary of the probability of exceedance of the 1-hour mean NO_2 AEGL-1 during the TS routine testing and maintenance schedule.

The probability of exceedance of the 1-hour mean NO_2 AEGL is <1% at all selected modelled receptor locations and therefore considered 'highly unlikely', this is except for receptor HR37 (Hadley Application) where a potential exceedance is predicted.

6.1.3 Impacts on Ecological Receptors

Tables D-4, D-5 and D-6 present a summary of the combined impacts on ecological receptors from the TS and TN routine testing and maintenance schedules.

At the European designated sites (ER1/ER2), the annual PC is <1% of the annual mean CLe/CLo and the maximum 24-hour PC is <10% of the daily mean CLe and impacts can therefore be considered 'insignificant'.

At the locally designated sites (ER3 to ER35), the annual PC is <100% of the annual mean CLe/CLo and the maximum 24-hour PC is <100% of the daily mean CLe and impacts can therefore be considered 'insignificant'.

6.2 TS – Outage Model

6.2.1 Annual Mean NO_2 Impacts

Annual mean NO_2 impacts associated with a hypothetical 26-hour emergency outage at TS are presented in Table D-7 of Appendix D.

The PC is <1% of the AQAL and therefore considered insignificant at the majority of receptors. The PC is >1% of the AQAL at receptor HR37 (Hadley Application), however the PEC is below the AQAL. No exceedances of the annual mean NO_2 AQAL are reported.

6.2.2 1-hour Mean NO_2 Impacts

AQAL

Table D-8 of Appendix D presents a summary of the probability of exceedance of the 1-hour mean NO_2 AQAL during a hypothetical 26-hour emergency outage at TS.

The probability of exceedance of the 1-hour mean NO_2 AQAL is <1% at all selected modelled receptor locations and therefore considered 'highly unlikely'.

AEGL-1

Table D-9 of Appendix D presents a summary of the probability of exceedance of the 1-hour mean NO_2 AEGL-1 during a hypothetical 26-hour emergency outage at TS.

The probability of exceedance of the 1-hour mean NO_2 AEGL is <1% at all selected modelled receptor locations and therefore considered 'highly unlikely', this is except for receptor HR37 (Hadley Application) where a potential exceedance is predicted.

6.2.3 Impacts on Ecological Receptors

Tables D-10, D-11 and D-12 present a summary of the impacts on ecological receptors from a hypothetical 26-hour emergency outage at TS.

At the European designated sites (ER1/ER2), the annual PC is <1% of the annual mean CLe/CLo and the maximum 24-hour PC is <10% of the daily mean CLe and impacts can therefore be considered 'insignificant'.

At the majority locally designated sites (ER3 to ER35), the annual PC is <100% of the annual mean CLe/CLo and the maximum 24-hour PC is <100% of the daily mean CLe and impacts can therefore be considered 'insignificant'. This is except for ER18 where the maximum 24-hour PC is >100% of the daily mean CLe.

6.3 TS & TN Cumulative – Outage Model

6.3.1 Annual Mean NO_2 Impacts

Annual mean NO_2 impacts associated with a hypothetical 26-hour emergency outage at TS and TN are presented in Table D-13 of Appendix D.

The PC is <1% of the AQAL and therefore considered insignificant at the majority of receptors. The PC is >1% of the AQAL at receptors HR15 (Orchard Wharf) and HR37 (Hadley Application), however the PEC is below the AQAL. No exceedances of the annual mean NO_2 AQAL are reported.

6.3.2 1-hour Mean NO_2 Impacts

AQAL

Table D-14 of Appendix D presents a summary of the probability of exceedance of the 1-hour mean NO_2 AQAL during a hypothetical 26-hour emergency outage at TS and TN.

The probability of exceedance of the 1-hour mean NO_2 AQAL is <1% at the majority of selected modelled receptor locations and therefore considered 'highly unlikely'. This is except for HR14 where the probability of exceedance is 1-5% and therefore considered 'unlikely'.

AEGL-1

Table D-15 of Appendix D presents a summary of the probability of exceedance of the 1-hour mean NO_2 AEGL-1 during a hypothetical 26-hour emergency outage at TS and TN.

The probability of exceedance of the 1-hour mean NO_2 AEGL is <1% at the majority of selected modelled receptor locations and therefore considered 'highly unlikely'.

The probability of exceedance is 1-5% at receptor HR8 and therefore considered 'unlikely'. The probability of exceedance is >5% at receptors HR9, HR10, HR11, HR14, HR15, HR37 and therefore potential exceedances are predicted.

A contour plot illustrating the 1% and 5% probability of exceedance thresholds is displayed in Appendix A.

6.3.3 Impacts on Ecological Receptors

Tables D-16, D-17 and D-18 and D-19 present a summary of the impacts on ecological receptors from a hypothetical 26-hour emergency outage at TS and TN.

At the European designated sites (ER1/ER2), the annual PC is <1% of the annual mean CLe/CLo and impacts can therefore be considered 'insignificant'. The maximum 24-hour PC is >10% of the daily mean CLe (10.1%), however the calculated PEC is well below 70% and impacts can therefore be considered 'insignificant'.

At all the locally designated sites (ER3 to ER35), the annual PC is <100% of the annual mean CLe/CLo and therefore considered 'insignificant'. The maximum 24-hour PC is >100% of the daily mean CLe at some of the locally designated sites – ER4, ER5, ER6, ER9, ER10, ER11, ER18, ER20, ER21, ER25, ER28, and ER31, however <100% at the remaining sites.

7.0 CONCLUSION

The AERA has considered the proposed changes to the SBGs at Telehouse South, in addition to the transfer of Telehouse North to the Telehouse South Environmental Permit. Potential air quality impacts as a result of routine testing and maintenance operations and non-routine emergency outage operation for Telehouse South, and Telehouse South cumulative with Telehouse North have been considered.

It is noted that the improvements at Telehouse South (new generators, vertical stack orientation and SCR) represent an improvement on the current permitted situation.

The main findings of the assessment are summarised below.

TS Routine Testing and Maintenance (MSM):

- no exceedances of the annual mean NO_2 AQAL are predicted;
- the risk of exceedance of the 1-hour mean AQAL is 'highly unlikely' at all modelled receptor locations;
- the risk of exceedance of the 1-hour mean AEGL-1 is 'highly unlikely' at all but one of the modelled receptor locations; and
- impacts on the annual mean CLe/CLo and daily mean CLe at all designated ecological sites are considered insignificant.

TS Emergency Outage Operation (OM):

- no exceedances of the annual mean NO_2 AQAL are predicted;
- the risk of exceedance of the 1-hour mean AQAL is 'highly unlikely' at all modelled receptor locations;
- the risk of exceedance of the 1-hour mean AEGL-1 is 'highly unlikely' at all but one of the modelled receptor locations;
- impacts on the annual mean CLe/CLo and daily mean CLe at the European designated sites (ER1/ER2) are considered insignificant; and
- impacts on the annual mean CLe/CLo at the locally designated sites are considered insignificant. Impacts on the daily mean CLe are considered insignificant at all but one of the locally designated sites (ER18).

TS & TN Emergency Outage Operation (OM):

- no exceedances of the annual mean NO_2 AQAL are predicted;
- the risk of exceedance of the 1-hour mean AQAL is 'highly unlikely' or 'unlikely' at all modelled receptor locations;
- the risk of exceedance of the 1-hour mean AEGL-1 is 'highly unlikely' or 'unlikely' at the majority of modelled receptor locations. However, there are potential exceedances predicted at 6 receptor locations;
- impacts on the annual mean CLe/CLo and daily mean CLe at the European designated sites (ER1/ER2) are considered insignificant; and
- impacts on the annual mean CLe/CLo at the locally designated sites are considered insignificant. The maximum daily mean PC is >100% of the CLe at some of the locally designated sites (12 sites), however <100% at the remaining sites.

APPENDIX A

Dispersion Modelling Plot Figures

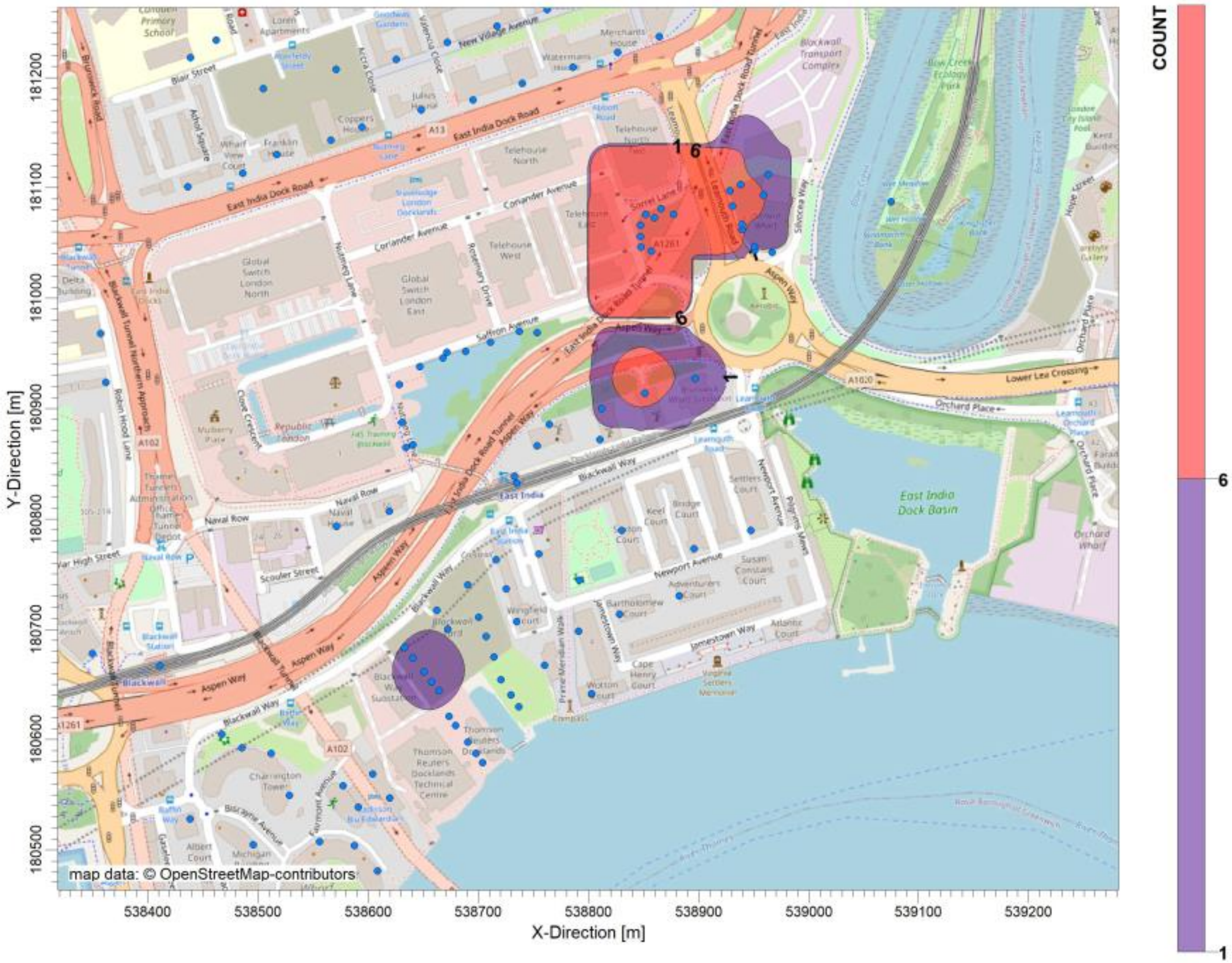

Figure A-1

TS & TN Cumulative OM – Thresholds for the Probability of Exceedance of the AEGL-1 (2019)

APPENDIX B

Model Files and Inputs (electronic only)

APPENDIX C

EA Dispersion Modelling Checklist

Item	Yes/No	Details / reason for omission
Location map	Y	Figure 4-1
Site plan	Y	Figure 3-1
Pollutants modelled and relevant AQALs	Y	Section 2.2 and 2.3
Details of modelled scenarios	Y	Section 5.2
Details of relevant ambient concentrations	Y	Section 4.0
Model description and justification	Y	Section 3.1
Special model treatment used	Y	Section 3.2 and 3.3
Table of emission parameters used	Y	Table 5-3 and Table 5-4
Details of modelled domain and receptors	Y	Section 4.2
Details of meteorological data used	Y	Section 3.1.6
Details of terrain treatment	Y	Section 3.1.3
Details of building treatment	Y	Section 3.1.4
Details of modelling deposition	Y	Section 3.3
Model uncertainty and sensitivity	Y	Section 3.1.1
Assessment of impacts	Y	Section 6.0
Contour plots	Y	Appendix A
Model files	Y	Appendix B

APPENDIX D

Dispersion Modelling Results

Maintenance Schedule Model (MSM)

Annual Mean NO_2 Impacts

Table D-1
MSM – Impacts on Annual Mean NO_2

ID	Max. PC (µg/m³)	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL
HR1	0.54	1.4%	29.5	73.8%
HR2	0.64	1.6%	29.6	74.1%
HR3	0.56	1.4%	29.6	73.9%
HR4	0.72	1.8%	29.7	74.3%
HR5	0.45	1.1%	29.4	73.6%
HR6	0.23	0.6%	-	-
HR7	0.15	0.4%	-	-
HR8	0.42	1.1%	33.5	83.8%
HR9	0.57	1.4%	33.7	84.1%
HR10	0.52	1.3%	33.6	84.0%
HR11	0.63	1.6%	33.7	84.3%
HR15	1.90	4.8%	30.9	77.2%
HR17	0.23	0.6%	-	-
HR19	0.17	0.4%	-	-
HR20	0.14	0.3%	-	-
HR21	0.13	0.3%	-	-
HR22	0.15	0.4%	-	-
HR23	0.13	0.3%	-	-
HR24	0.17	0.4%	-	-
HR25	0.17	0.4%	-	-
HR26	0.19	0.5%	-	-
HR27	0.31	0.8%	-	-
HR28	0.26	0.7%	-	-
HR29	0.20	0.5%	-	-
HR30	0.27	0.7%	-	-
HR31	0.25	0.6%	-	-
HR32	0.34	0.8%	-	-
HR33	0.25	0.6%	-	-
HR34	0.26	0.6%	-	-
HR35	0.24	0.6%	-	-
HR36	0.23	0.6%	-	-
HR37	0.89	2.2%	34.0	85.0%

ID	Max. PC (µg/m³)	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL
HR38	0.37	0.9%	-	-
HR39	0.34	0.9%	-	-
HR40	0.30	0.8%	-	-
HR41	0.25	0.6%	-	-
HR42	0.17	0.4%	-	-
HR43	0.14	0.4%	-	-
HR48	0.29	0.7%	-	-
HR49	0.42	1.1%	29.4	73.5%
HR50	0.42	1.1%	29.4	73.5%
HR51	0.21	0.5%	-	-
HR54	0.28	0.7%	-	-
HR55	0.26	0.7%	-	-
HR59	0.32	0.8%	-	-
Table note: The PEC has not been calculated where the PC is insignificant (i.e. <1%).				

TS 1-hour Mean NO_2 Impacts

AQAL

Table D-2
TS MSM – Risk of Exceedance of 1-hour Mean NO_2 AQAL

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m³)	No. of Potential Exceedances	Probability of Exceedance (A)
HR1	43.8	0	0.0%
HR2	44.6	0	0.0%
HR3	35.5	0	0.0%
HR4	45.2	0	0.0%
HR5	35.6	0	0.0%
HR6	32.1	0	0.0%
HR7	31.0	0	0.0%
HR8	121.8	0	0.0%
HR9	117.5	0	0.0%
HR10	63.2	0	0.0%
HR11	56.7	0	0.0%
HR12	66.3	0	0.0%
HR13	63.4	0	0.0%
HR14	63.0	0	0.0%
HR15	80.4	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR16	441.3	192	0.0%
HR17	265.4	61	0.0%
HR18	71.3	0	0.0%
HR19	300.3	47	0.0%
HR20	79.4	0	0.0%
HR21	63.6	0	0.0%
HR22	120.2	0	0.0%
HR23	90.9	0	0.0%
HR24	80.8	0	0.0%
HR25	84.9	0	0.0%
HR26	73.8	0	0.0%
HR27	137.3	1	0.0%
HR28	128.0	0	0.0%
HR29	94.7	0	0.0%
HR30	94.6	0	0.0%
HR31	69.1	0	0.0%
HR32	55.0	0	0.0%
HR33	75.1	0	0.0%
HR34	45.8	0	0.0%
HR35	45.8	0	0.0%
HR36	72.3	0	0.0%
HR37	1629.0	1627	0.0%
HR38	32.7	0	0.0%
HR39	39.1	0	0.0%
HR40	43.9	0	0.0%
HR41	31.7	0	0.0%
HR42	33.1	0	0.0%
HR43	30.3	0	0.0%
HR44	53.3	0	0.0%
HR45	64.6	0	0.0%
HR46	60.9	0	0.0%
HR47	63.4	0	0.0%
HR48	33.2	0	0.0%
HR49	37.1	0	0.0%
HR50	33.0	0	0.0%
HR51	35.6	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR52	35.6	0	0.0%
HR53	29.3	0	0.0%
HR54	39.7	0	0.0%
HR55	40.5	0	0.0%
HR56	31.8	0	0.0%
HR57	59.3	0	0.0%
HR58	35.1	0	0.0%
HR59	32.5	0	0.0%

Table note:
(A) Probability of exceedance based on 37.5 hours MSM.

AEGL-1

Table D-3
TS MSM – Risk of Exceedance of 1-hour Mean NO_2 AEGL-1

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR1	43.8	0	0.0%
HR2	44.6	0	0.0%
HR3	35.5	0	0.0%
HR4	45.2	0	0.0%
HR5	35.6	0	0.0%
HR6	32.1	0	0.0%
HR7	31.0	0	0.0%
HR8	121.8	0	0.0%
HR9	117.5	0	0.0%
HR10	63.2	0	0.0%
HR11	56.7	0	0.0%
HR12	66.3	0	0.0%
HR13	63.4	0	0.0%
HR14	63.0	0	0.0%
HR15	80.4	0	0.0%
HR16	441.3	0	0.0%
HR17	265.4	0	0.0%
HR18	71.3	0	0.0%
HR19	300.3	0	0.0%
HR20	79.4	0	0.0%
HR21	63.6	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR22	120.2	0	0.0%
HR23	90.9	0	0.0%
HR24	80.8	0	0.0%
HR25	84.9	0	0.0%
HR26	73.8	0	0.0%
HR27	137.3	0	0.0%
HR28	128.0	0	0.0%
HR29	94.7	0	0.0%
HR30	94.6	0	0.0%
HR31	69.1	0	0.0%
HR32	55.0	0	0.0%
HR33	75.1	0	0.0%
HR34	45.8	0	0.0%
HR35	45.8	0	0.0%
HR36	72.3	0	0.0%
HR37	1629.0	190	141.5%
HR38	32.7	0	0.0%
HR39	39.1	0	0.0%
HR40	43.9	0	0.0%
HR41	31.7	0	0.0%
HR42	33.1	0	0.0%
HR43	30.3	0	0.0%
HR44	53.3	0	0.0%
HR45	64.6	0	0.0%
HR46	60.9	0	0.0%
HR47	63.4	0	0.0%
HR48	33.2	0	0.0%
HR49	37.1	0	0.0%
HR50	33.0	0	0.0%
HR51	35.6	0	0.0%
HR52	35.6	0	0.0%
HR53	29.3	0	0.0%
HR54	39.7	0	0.0%
HR55	40.5	0	0.0%
HR56	31.8	0	0.0%
HR57	59.3	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR58	35.1	0	0.0%
HR59	32.5	0	0.0%

Table note:
(A) Probability of exceedance based on 37.5 hours MSM.

Impacts on Ecological Receptors

Table D-4
MSM – Impacts on NO_x Critical Levels

ID	Max. Annual Mean NO_x PC (µg/m^3)	PC as % of CLe	Max. Potential Daily Mean NO_x PC (µg/m^3)	PC as % of CLe
ER1	0.01	<0.1%	1.1	0.6%
ER2	0.01	<0.1%	1.1	0.6%
ER3	0.03	0.1%	5.3	2.7%
ER4	0.13	0.4%	24.0	12.0%
ER5	0.09	0.3%	18.3	9.1%
ER6	0.13	0.4%	15.6	7.8%
ER7	0.03	0.1%	4.0	2.0%
ER8	0.03	0.1%	5.3	2.6%
ER9	0.37	1.2%	29.7	14.9%
ER10	0.46	1.5%	74.4	37.2%
ER11	0.35	1.2%	33.2	16.6%
ER12	0.07	0.2%	7.6	3.8%
ER13	0.07	0.2%	6.3	3.1%
ER14	0.06	0.2%	9.7	4.8%
ER15	0.05	0.2%	6.1	3.1%
ER16	0.05	0.2%	10.8	5.4%
ER17	0.04	0.1%	6.7	3.3%
ER18	0.75	2.5%	63.3	31.7%
ER19	0.03	0.1%	4.4	2.2%
ER20	0.66	2.2%	42.7	21.3%
ER21	0.27	0.9%	25.0	12.5%
ER22	0.11	0.4%	11.3	5.7%
ER23	0.06	0.2%	5.5	2.7%
ER24	0.12	0.4%	7.0	3.5%
ER25	0.23	0.8%	18.0	9.0%
ER26	0.05	0.2%	6.9	3.4%
ER27	0.04	0.1%	11.1	5.6%

ID	Max. Annual Mean NO_x PC (µg/m³)	PC as % of CLe	Max. Potential Daily Mean NO_x PC (µg/m³)	PC as % of CLe
ER28	0.31	1.0%	21.1	10.6%
ER29	0.10	0.3%	7.7	3.8%
ER30	0.12	0.4%	12.9	6.5%
ER31	0.10	0.3%	14.9	7.4%
ER32	0.03	0.1%	6.7	3.3%
ER33	0.08	0.3%	6.2	3.1%
ER34	0.03	0.1%	5.1	2.5%
ER35	0.02	0.1%	4.2	2.1%

Table D-5
MSM – Impacts on Nitrogen Critical Loads

ID	Applied CLo (kg N/ha/yr)	Max. PC (kg N/ha/yr)	PC as % of CLo
ER1	15	<0.01	<0.1%
ER2	10	<0.01	<0.1%
ER3	20	<0.01	<0.1%
ER4	10	0.03	0.3%
ER5	20	0.01	<0.1%
ER6	20	0.01	0.1%
ER7	20	<0.01	<0.1%
ER8	10	0.01	0.1%
ER9	20	0.04	0.2%
ER10	10	0.09	0.9%
ER11	20	0.04	0.2%
ER12	20	0.01	<0.1%
ER13	10	0.01	0.1%
ER14	20	0.01	<0.1%
ER15	20	<0.01	<0.1%
ER16	10	0.01	0.1%
ER17	20	<0.01	<0.1%
ER18	20	0.08	0.4%
ER19	10	0.01	0.1%
ER20	10	0.13	1.3%
ER21	20	0.03	0.1%
ER22	20	0.01	0.1%
ER23	20	0.01	<0.1%
ER24	10	0.02	0.2%

ID	Applied CLo (kg N/ha/yr)	Max. PC (kg N/ha/yr)	PC as % of CLo
ER25	20	0.02	0.1%
ER26	20	0.01	<0.1%
ER27	10	0.01	0.1%
ER28	20	0.03	0.2%
ER29	20	0.01	<0.1%
ER30	20	0.01	0.1%
ER31	20	0.01	<0.1%
ER32	10	0.01	0.1%
ER33	20	0.01	<0.1%
ER34	20	<0.01	<0.1%
ER35	10	<0.01	<0.1%

Table D-6
MSM – Impacts on Acid Critical Loads

ID	Applied CLo CLmaxN (kg_{eq}/ha/yr)	Max. N PC (kg_{eq}/ha/yr)	PC as % of CLo
ER1	5.07	<0.01	<0.1%
ER2	1.73	<0.01	<0.1%
ER3	5.07	<0.01	<0.1%
ER4	8.67	<0.01	<0.1%
ER5	5.07	<0.01	<0.1%
ER6	5.07	<0.01	<0.1%
ER7	5.07	<0.01	<0.1%
ER8	8.67	<0.01	<0.1%
ER9	5.07	<0.01	0.1%
ER10	8.67	0.01	0.1%
ER11	5.07	<0.01	<0.1%
ER12	5.07	<0.01	<0.1%
ER13	2.08	<0.01	<0.1%
ER14	5.07	<0.01	<0.1%
ER15	5.07	<0.01	<0.1%
ER16	8.68	<0.01	<0.1%
ER17	5.07	<0.01	<0.1%
ER18	5.07	0.01	0.1%
ER19	8.67	<0.01	<0.1%
ER20	8.67	0.01	0.1%
ER21	5.07	<0.01	<0.1%

ID	Applied CLo CLmaxN (kg_{eq}/ha/yr)	Max. N PC (kg_{eq}/ha/yr)	PC as % of CLo
ER22	5.07	<0.01	<0.1%
ER23	5.07	<0.01	<0.1%
ER24	8.66	<0.01	<0.1%
ER25	5.07	<0.01	<0.1%
ER26	5.07	<0.01	<0.1%
ER27	8.68	<0.01	<0.1%
ER28	5.07	<0.01	<0.1%
ER29	5.07	<0.01	<0.1%
ER30	5.07	<0.01	<0.1%
ER31	5.07	<0.01	<0.1%
ER32	8.68	<0.01	<0.1%
ER33	5.07	<0.01	<0.1%
ER34	5.07	<0.01	<0.1%
ER35	2.08	<0.01	<0.1%

TS – Outage Model

Annual Mean NO_2 Impacts

Table D-7
TS OM – Impacts on Annual Mean NO_2

ID	Max. PC (µg/m^3) for 26 Hours	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
HR1	<0.1	<0.1%	-	-
HR2	<0.1	<0.1%	-	-
HR3	<0.1	<0.1%	-	-
HR4	<0.1	<0.1%	-	-
HR5	<0.1	<0.1%	-	-
HR6	<0.1	<0.1%	-	-
HR7	<0.1	<0.1%	-	-
HR8	<0.1	<0.1%	-	-
HR9	<0.1	<0.1%	-	-
HR10	<0.1	<0.1%	-	-
HR11	<0.1	<0.1%	-	-
HR15	<0.1	<0.1%	-	-
HR17	0.1	0.2%	-	-
HR19	<0.1	0.1%	-	-
HR20	<0.1	0.1%	-	-

ID	Max. PC (µg/m³) for 26 Hours	PC as % of AQAL	PEC (µg/m³)	PEC as % of AQAL
HR21	<0.1	<0.1%	-	-
HR22	<0.1	<0.1%	-	-
HR23	<0.1	<0.1%	-	-
HR24	<0.1	<0.1%	-	-
HR25	<0.1	<0.1%	-	-
HR26	<0.1	0.1%	-	-
HR27	0.1	0.2%	-	-
HR28	0.1	0.2%	-	-
HR29	<0.1	0.1%	-	-
HR30	0.1	0.2%	-	-
HR31	<0.1	0.1%	-	-
HR32	<0.1	0.1%	-	-
HR33	<0.1	0.1%	-	-
HR34	<0.1	0.1%	-	-
HR35	<0.1	0.1%	-	-
HR36	<0.1	0.1%	-	-
HR37	0.5	1.3%	33.6	84.0%
HR38	<0.1	<0.1%	-	-
HR39	<0.1	<0.1%	-	-
HR40	<0.1	<0.1%	-	-
HR41	<0.1	<0.1%	-	-
HR42	<0.1	<0.1%	-	-
HR43	<0.1	<0.1%	-	-
HR48	<0.1	<0.1%	-	-
HR49	<0.1	<0.1%	-	-
HR50	<0.1	<0.1%	-	-
HR51	<0.1	<0.1%	-	-
HR54	<0.1	<0.1%	-	-
HR55	<0.1	<0.1%	-	-
HR59	<0.1	<0.1%	-	-

Table note:
The PEC has not been calculated where the PC is insignificant (i.e. <1%).

1-hour Mean NO_2 Impacts

AQAL

Table D-8
TS OM – Risk of Exceedance of 1-hour Mean NO_2 AQAL

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance (A)
HR1	39.3	0	0.0%
HR2	40.0	0	0.0%
HR3	31.9	0	0.0%
HR4	40.3	0	0.0%
HR5	31.8	0	0.0%
HR6	30.1	0	0.0%
HR7	27.8	0	0.0%
HR8	108.7	0	0.0%
HR9	104.9	0	0.0%
HR10	56.8	0	0.0%
HR11	50.8	0	0.0%
HR12	59.5	0	0.0%
HR13	56.9	0	0.0%
HR14	56.6	0	0.0%
HR15	72.5	0	0.0%
HR16	417.4	184	0.0%
HR17	240.0	58	0.0%
HR18	64.1	0	0.0%
HR19	291.1	47	0.0%
HR20	72.0	0	0.0%
HR21	57.8	0	0.0%
HR22	107.3	0	0.0%
HR23	81.1	0	0.0%
HR24	76.6	0	0.0%
HR25	75.9	0	0.0%
HR26	66.2	0	0.0%
HR27	131.5	0	0.0%
HR28	124.5	0	0.0%
HR29	85.2	0	0.0%
HR30	85.2	0	0.0%
HR31	62.0	0	0.0%
HR32	50.0	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance [(A)]
HR33	67.5	0	0.0%
HR34	40.3	0	0.0%
HR35	34.5	0	0.0%
HR36	62.0	0	0.0%
HR37	1626.0	1564	0.0%
HR38	30.9	0	0.0%
HR39	35.0	0	0.0%
HR40	39.2	0	0.0%
HR41	28.4	0	0.0%
HR42	29.5	0	0.0%
HR43	27.9	0	0.0%
HR44	51.1	0	0.0%
HR45	58.0	0	0.0%
HR46	55.2	0	0.0%
HR47	56.8	0	0.0%
HR48	29.8	0	0.0%
HR49	33.7	0	0.0%
HR50	29.6	0	0.0%
HR51	32.3	0	0.0%
HR52	31.9	0	0.0%
HR53	26.3	0	0.0%
HR54	35.9	0	0.0%
HR55	37.0	0	0.0%
HR56	30.1	0	0.0%
HR57	58.9	0	0.0%
HR58	31.5	0	0.0%
HR59	30.7	0	0.0%

Table note:
(A) Probability of exceedance based on 26 hours operation.

AEGL-1

Table D-9
TS OM – Risk of Exceedance of 1-hour Mean NO_2 AEGL-1

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance [(A)]
HR1	39.3	0	0.0%
HR2	40.0	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance (A)
HR3	31.9	0	0.0%
HR4	40.3	0	0.0%
HR5	31.8	0	0.0%
HR6	30.1	0	0.0%
HR7	27.8	0	0.0%
HR8	108.7	0	0.0%
HR9	104.9	0	0.0%
HR10	56.8	0	0.0%
HR11	50.8	0	0.0%
HR12	59.5	0	0.0%
HR13	56.9	0	0.0%
HR14	56.6	0	0.0%
HR15	72.5	0	0.0%
HR16	417.4	0	0.0%
HR17	240.0	0	0.0%
HR18	64.1	0	0.0%
HR19	291.1	0	0.0%
HR20	72.0	0	0.0%
HR21	57.8	0	0.0%
HR22	107.3	0	0.0%
HR23	81.1	0	0.0%
HR24	76.6	0	0.0%
HR25	75.9	0	0.0%
HR26	66.2	0	0.0%
HR27	131.5	0	0.0%
HR28	124.5	0	0.0%
HR29	85.2	0	0.0%
HR30	85.2	0	0.0%
HR31	62.0	0	0.0%
HR32	50.0	0	0.0%
HR33	67.5	0	0.0%
HR34	40.3	0	0.0%
HR35	34.5	0	0.0%
HR36	62.0	0	0.0%
HR37	1626.0	166	98.1%
HR38	30.9	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance [(A)]
HR39	35.0	0	0.0%
HR40	39.2	0	0.0%
HR41	28.4	0	0.0%
HR42	29.5	0	0.0%
HR43	27.9	0	0.0%
HR44	51.1	0	0.0%
HR45	58.0	0	0.0%
HR46	55.2	0	0.0%
HR47	56.8	0	0.0%
HR48	29.8	0	0.0%
HR49	33.7	0	0.0%
HR50	29.6	0	0.0%
HR51	32.3	0	0.0%
HR52	31.9	0	0.0%
HR53	26.3	0	0.0%
HR54	35.9	0	0.0%
HR55	37.0	0	0.0%
HR56	30.1	0	0.0%
HR57	58.9	0	0.0%
HR58	31.5	0	0.0%
HR59	30.7	0	0.0%

Table note:
[(A)] Probability of exceedance based on 26 hours operation.

Impacts on Ecological Receptors

Table D-10
TS OM – Impacts on NO_x Critical Levels

ID	Max. Annual Mean NO_x PC ($\mu g/m^3$) for 26 Hours	PC as % of CLe	Max. Potential Daily Mean NO_x PC ($\mu g/m^3$)	PC as % of CLe
ER1	<0.01	<0.1%	1.2	0.6%
ER2	<0.01	<0.1%	1.1	0.6%
ER3	<0.01	<0.1%	5.4	2.7%
ER4	0.02	0.1%	60.5	30.3%
ER5	0.01	<0.1%	36.8	18.4%
ER6	0.01	<0.1%	28.2	14.1%
ER7	<0.01	<0.1%	9.1	4.6%

ID	Max. Annual Mean NO_x PC (µg/m^3) for 26 Hours	PC as % of CLe	Max. Potential Daily Mean NO_x PC (µg/m^3)	PC as % of CLe
ER8	<0.01	<0.1%	10.2	5.1%
ER9	0.03	0.1%	45.0	22.5%
ER10	0.02	0.1%	60.3	30.1%
ER11	0.01	<0.1%	35.1	17.5%
ER12	<0.01	<0.1%	7.4	3.7%
ER13	<0.01	<0.1%	6.2	3.1%
ER14	<0.01	<0.1%	8.8	4.4%
ER15	<0.01	<0.1%	6.0	3.0%
ER16	<0.01	<0.1%	9.1	4.6%
ER17	<0.01	<0.1%	9.0	4.5%
ER18	0.06	0.2%	227.9	114.0%
ER19	<0.01	<0.1%	7.7	3.9%
ER20	0.02	0.1%	30.3	15.1%
ER21	0.01	<0.1%	28.9	14.5%
ER22	<0.01	<0.1%	9.6	4.8%
ER23	<0.01	<0.1%	5.6	2.8%
ER24	<0.01	<0.1%	9.1	4.5%
ER25	<0.01	<0.1%	10.6	5.3%
ER26	<0.01	<0.1%	6.4	3.2%
ER27	<0.01	<0.1%	7.5	3.7%
ER28	0.01	<0.1%	23.6	11.8%
ER29	<0.01	<0.1%	7.6	3.8%
ER30	<0.01	<0.1%	8.5	4.2%
ER31	<0.01	<0.1%	15.3	7.6%
ER32	<0.01	<0.1%	4.8	2.4%
ER33	<0.01	<0.1%	6.4	3.2%
ER34	<0.01	<0.1%	4.1	2.1%
ER35	<0.01	<0.1%	3.6	1.8%

Table D-11
TS OM – Impacts on Nitrogen Critical Loads

ID	Applied CLo (kg N/ha/yr)	Max. PC (based on 26 Hours operation) (kg N/ha/yr)	PC as % of CLo
ER1	15	<0.01	<0.1%
ER2	10	<0.01	<0.1%

ID	Applied CLo (kg N/ha/yr)	Max. PC (based on 26 Hours operation) (kg N/ha/yr)	PC as % of CLo
ER3	20	<0.01	<0.1%
ER4	10	<0.01	<0.1%
ER5	20	<0.01	<0.1%
ER6	20	<0.01	<0.1%
ER7	20	<0.01	<0.1%
ER8	10	<0.01	<0.1%
ER9	20	<0.01	<0.1%
ER10	10	<0.01	<0.1%
ER11	20	<0.01	<0.1%
ER12	20	<0.01	<0.1%
ER13	10	<0.01	<0.1%
ER14	20	<0.01	<0.1%
ER15	20	<0.01	<0.1%
ER16	10	<0.01	<0.1%
ER17	20	<0.01	<0.1%
ER18	20	0.01	<0.1%
ER19	10	<0.01	<0.1%
ER20	10	<0.01	<0.1%
ER21	20	<0.01	<0.1%
ER22	20	<0.01	<0.1%
ER23	20	<0.01	<0.1%
ER24	10	<0.01	<0.1%
ER25	20	<0.01	<0.1%
ER26	20	<0.01	<0.1%
ER27	10	<0.01	<0.1%
ER28	20	<0.01	<0.1%
ER29	20	<0.01	<0.1%
ER30	20	<0.01	<0.1%
ER31	20	<0.01	<0.1%
ER32	10	<0.01	<0.1%
ER33	20	<0.01	<0.1%
ER34	20	<0.01	<0.1%
ER35	10	<0.01	<0.1%

Table D-12
TS OM – Impacts on Acid Critical Loads

ID	Applied CLo CLmaxN (kg_{eq}/ha/yr)	Max. N PC (based on 26 Hours operation) (kg_{eq}/ha/yr)	PC as % of CLo
ER1	5.07	<0.01	<0.1%
ER2	1.73	<0.01	<0.1%
ER3	5.07	<0.01	<0.1%
ER4	8.67	<0.01	<0.1%
ER5	5.07	<0.01	<0.1%
ER6	5.07	<0.01	<0.1%
ER7	5.07	<0.01	<0.1%
ER8	8.67	<0.01	<0.1%
ER9	5.07	<0.01	<0.1%
ER10	8.67	<0.01	<0.1%
ER11	5.07	<0.01	<0.1%
ER12	5.07	<0.01	<0.1%
ER13	2.08	<0.01	<0.1%
ER14	5.07	<0.01	<0.1%
ER15	5.07	<0.01	<0.1%
ER16	8.68	<0.01	<0.1%
ER17	5.07	<0.01	<0.1%
ER18	5.07	<0.01	<0.1%
ER19	8.67	<0.01	<0.1%
ER20	8.67	<0.01	<0.1%
ER21	5.07	<0.01	<0.1%
ER22	5.07	<0.01	<0.1%
ER23	5.07	<0.01	<0.1%
ER24	8.66	<0.01	<0.1%
ER25	5.07	<0.01	<0.1%
ER26	5.07	<0.01	<0.1%
ER27	8.68	<0.01	<0.1%
ER28	5.07	<0.01	<0.1%
ER29	5.07	<0.01	<0.1%
ER30	5.07	<0.01	<0.1%
ER31	5.07	<0.01	<0.1%
ER32	8.68	<0.01	<0.1%
ER33	5.07	<0.01	<0.1%

ID	Applied CLo CLmaxN (kg_{eq}/ha/yr)	Max. N PC (based on 26 Hours operation) (kg_{eq}/ha/yr)	PC as % of CLo
ER34	5.07	<0.01	<0.1%
ER35	2.08	<0.01	<0.1%

TS & TN Cumulative – Outage Model

Annual Mean NO_2 Impacts

Table D-13
TS & TN Cumulative OM – Impacts on Annual Mean NO_2

ID	Max. PC (µg/m^3)	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
HR1	0.3	0.7%	-	-
HR2	0.3	0.7%	-	-
HR3	0.3	0.7%	-	-
HR4	0.4	0.9%	-	-
HR5	0.2	0.6%	-	-
HR6	0.1	0.3%	-	-
HR7	0.1	0.2%	-	-
HR8	0.2	0.5%	-	-
HR9	0.3	0.6%	-	-
HR10	0.2	0.6%	-	-
HR11	0.3	0.8%	-	-
HR15	0.8	2.0%	29.8	74.5%
HR17	0.1	0.3%	-	-
HR19	0.1	0.2%	-	-
HR20	0.1	0.2%	-	-
HR21	0.1	0.2%	-	-
HR22	0.1	0.2%	-	-
HR23	0.1	0.2%	-	-
HR24	0.1	0.2%	-	-
HR25	0.1	0.2%	-	-
HR26	0.1	0.2%	-	-
HR27	0.1	0.4%	-	-
HR28	0.1	0.3%	-	-
HR29	0.1	0.2%	-	-
HR30	0.1	0.3%	-	-
HR31	0.1	0.3%	-	-
HR32	0.2	0.4%	-	-

ID	Max. PC (µg/m^3)	PC as % of AQAL	PEC (µg/m^3)	PEC as % of AQAL
HR33	0.1	0.3%	-	-
HR34	0.1	0.3%	-	-
HR35	0.1	0.3%	-	-
HR36	0.1	0.3%	-	-
HR37	0.5	1.2%	33.6	83.9%
HR38	0.2	0.4%	-	-
HR39	0.2	0.4%	-	-
HR40	0.1	0.4%	-	-
HR41	0.1	0.3%	-	-
HR42	0.1	0.2%	-	-
HR43	0.1	0.2%	-	-
HR48	0.1	0.4%	-	-
HR49	0.2	0.5%	-	-
HR50	0.2	0.5%	-	-
HR51	0.1	0.3%	-	-
HR54	0.1	0.3%	-	-
HR55	0.1	0.3%	-	-
HR59	0.2	0.4%	-	-
Table note: The PEC has not been calculated where the PC is insignificant (i.e. <1%).				

1-hour Mean NO_2 Impacts

AQAL

Table D-14
TS & TN Cumulative OM – Risk of Exceedance of 1-hour Mean NO_2 AQAL

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance [(A)]
HR1	337.5	1164	0.0%
HR2	305.4	1281	0.0%
HR3	397.0	1136	0.0%
HR4	435.4	1449	0.0%
HR5	452.2	956	0.0%
HR6	502.3	322	0.0%
HR7	290.7	249	0.0%
HR8	992.0	706	0.0%
HR9	1262.5	809	0.0%
HR10	1945.4	638	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance (A)
HR11	1556.6	1178	0.0%
HR12	388.4	523	0.0%
HR13	286.6	291	0.0%
HR14	6878.6	4329	3.1%
HR15	2952.7	3430	0.1%
HR16	566.6	374	0.0%
HR17	506.7	287	0.0%
HR18	365.6	249	0.0%
HR19	456.7	260	0.0%
HR20	305.3	225	0.0%
HR21	454.1	219	0.0%
HR22	488.3	181	0.0%
HR23	432.5	171	0.0%
HR24	262.3	324	0.0%
HR25	271.1	352	0.0%
HR26	283.3	297	0.0%
HR27	268.1	353	0.0%
HR28	292.8	338	0.0%
HR29	290.6	340	0.0%
HR30	307.6	392	0.0%
HR31	383.4	462	0.0%
HR32	508.8	626	0.0%
HR33	328.3	441	0.0%
HR34	408.7	409	0.0%
HR35	265.3	386	0.0%
HR36	315.4	804	0.0%
HR37	1406.8	1537	0.0%
HR38	310.3	441	0.0%
HR39	321.0	416	0.0%
HR40	324.0	476	0.0%
HR41	318.0	396	0.0%
HR42	213.6	169	0.0%
HR43	413.6	141	0.0%
HR44	211.1	146	0.0%
HR45	303.7	333	0.0%
HR46	493.7	515	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR47	296.4	355	0.0%
HR48	604.6	624	0.0%
HR49	694.3	924	0.0%
HR50	538.8	1010	0.0%
HR51	364.6	412	0.0%
HR52	243.1	186	0.0%
HR53	254.1	600	0.0%
HR54	251.7	537	0.0%
HR55	261.9	556	0.0%
HR56	264.2	449	0.0%
HR57	200.5	123	0.0%
HR58	206.5	123	0.0%
HR59	326.9	918	0.0%

Table note:
(A) Probability of exceedance based on 26 hours operation.

AEGL-1

Table D-15
TS & TN Cumulative OM – Risk of Exceedance of 1-hour Mean NO_2 AEGL-1

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR1	337.5	0	0.0%
HR2	305.4	0	0.0%
HR3	397.0	0	0.0%
HR4	435.4	0	0.0%
HR5	452.2	0	0.0%
HR6	502.3	0	0.0%
HR7	290.7	0	0.0%
HR8	992.0	3	2.2%
HR9	1262.5	40	28.1%
HR10	1945.4	85	56.1%
HR11	1556.6	41	28.7%
HR12	388.4	0	0.0%
HR13	286.6	0	0.0%
HR14	6878.6	1966	249.7%
HR15	2952.7	153	92.0%
HR16	566.6	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC (µg/m^3)	No. of Potential Exceedances	Probability of Exceedance (A)
HR17	506.7	0	0.0%
HR18	365.6	0	0.0%
HR19	456.7	0	0.0%
HR20	305.3	0	0.0%
HR21	454.1	0	0.0%
HR22	488.3	0	0.0%
HR23	432.5	0	0.0%
HR24	262.3	0	0.0%
HR25	271.1	0	0.0%
HR26	283.3	0	0.0%
HR27	268.1	0	0.0%
HR28	292.8	0	0.0%
HR29	290.6	0	0.0%
HR30	307.6	0	0.0%
HR31	383.4	0	0.0%
HR32	508.8	0	0.0%
HR33	328.3	0	0.0%
HR34	408.7	0	0.0%
HR35	265.3	0	0.0%
HR36	315.4	0	0.0%
HR37	1406.8	56	38.4%
HR38	310.3	0	0.0%
HR39	321.0	0	0.0%
HR40	324.0	0	0.0%
HR41	318.0	0	0.0%
HR42	213.6	0	0.0%
HR43	413.6	0	0.0%
HR44	211.1	0	0.0%
HR45	303.7	0	0.0%
HR46	493.7	0	0.0%
HR47	296.4	0	0.0%
HR48	604.6	0	0.0%
HR49	694.3	0	0.0%
HR50	538.8	0	0.0%
HR51	364.6	0	0.0%
HR52	243.1	0	0.0%

ID	Max. Potential 1-hour Mean (100%ile) NO_2 PC ($\mu g/m^3$)	No. of Potential Exceedances	Probability of Exceedance (A)
HR53	254.1	0	0.0%
HR54	251.7	0	0.0%
HR55	261.9	0	0.0%
HR56	264.2	0	0.0%
HR57	200.5	0	0.0%
HR58	206.5	0	0.0%
HR59	326.9	0	0.0%

Table note:
(A) Probability of exceedance based on 26 hours operation.

Impacts on Ecological Receptors

Table D-16
TS & TN Cumulative OM – Impacts on Annual Mean NO_x Critical Levels

ID	Max. Annual Mean NO_x PC ($\mu g/m^3$) for 26 Hours	PC as % of CLe
ER1	<0.01	<0.1%
ER2	<0.01	<0.1%
ER3	0.01	<0.1%
ER4	0.06	0.2%
ER5	0.04	0.1%
ER6	0.06	0.2%
ER7	0.01	<0.1%
ER8	0.02	0.1%
ER9	0.17	0.6%
ER10	0.21	0.7%
ER11	0.17	0.6%
ER12	0.03	0.1%
ER13	0.03	0.1%
ER14	0.03	0.1%
ER15	0.02	0.1%
ER16	0.02	0.1%
ER17	0.02	0.1%
ER18	0.35	1.2%
ER19	0.01	<0.1%
ER20	0.31	1.0%
ER21	0.13	0.4%
ER22	0.05	0.2%

ID	Max. Annual Mean NO_x PC (µg/m^3) for 26 Hours	PC as % of CLe
ER23	0.03	0.1%
ER24	0.05	0.2%
ER25	0.11	0.4%
ER26	0.02	0.1%
ER27	0.02	0.1%
ER28	0.15	0.5%
ER29	0.05	0.2%
ER30	0.06	0.2%
ER31	0.04	0.1%
ER32	0.01	<0.1%
ER33	0.04	0.1%
ER34	0.01	<0.1%
ER35	0.01	<0.1%

Table D-17
TS & TN Cumulative OM – Impacts on Daily Mean NO_x Critical Levels

ID	Max. Potential Daily Mean NO_x PC (µg/m^3)	PC as % of CLe	NO_x PEC (µg/m^3)	PEC as % of CLe
ER1	20.2	10.1%	94.2	47.1%
ER2	20.1	10.1%	92.0	46.0%
ER3	83.3	41.6%	-	-
ER4	332.9	166.5%	-	-
ER5	278.0	139.0%	-	-
ER6	252.7	126.3%	-	-
ER7	64.5	32.2%	-	-
ER8	81.8	40.9%	-	-
ER9	370.8	185.4%	-	-
ER10	578.8	289.4%	-	-
ER11	498.7	249.4%	-	-
ER12	117.0	58.5%	-	-
ER13	100.9	50.4%	-	-
ER14	147.3	73.7%	-	-
ER15	99.2	49.6%	-	-
ER16	172.9	86.5%	-	-
ER17	118.6	59.3%	-	-
ER18	530.9	265.4%	-	-
ER19	69.3	34.6%	-	-

ID	Max. Potential Daily Mean NO_x PC (µg/m³)	PC as % of CLe	NO_x PEC (µg/m³)	PEC as % of CLe
ER20	410.1	205.0%		
ER21	317.4	158.7%	-	-
ER22	170.9	85.5%	-	-
ER23	89.6	44.8%	-	-
ER24	116.6	58.3%	-	-
ER25	245.4	122.7%	-	-
ER26	110.3	55.2%	-	-
ER27	157.6	78.8%	-	-
ER28	251.1	125.6%	-	-
ER29	117.5	58.7%	-	-
ER30	192.3	96.2%	-	-
ER31	234.8	117.4%	-	-
ER32	99.0	49.5%	-	-
ER33	92.6	46.3%	-	-
ER34	81.5	40.7%	-	-
ER35	63.8	31.9%	-	-

Table D-18
TS & TN Cumulative OM – Impacts on Nitrogen Critical Loads

ID	Applied CLo (kg N/ha/yr)	Max. PC (kg N/ha/yr)	PC as % of CLo
ER1	15	<0.01	<0.1%
ER2	10	<0.01	<0.1%
ER3	20	<0.01	<0.1%
ER4	10	0.01	0.1%
ER5	20	<0.01	<0.1%
ER6	20	0.01	<0.1%
ER7	20	<0.01	<0.1%
ER8	10	<0.01	<0.1%
ER9	20	0.02	0.1%
ER10	10	0.04	0.4%
ER11	20	0.02	0.1%
ER12	20	<0.01	<0.1%
ER13	10	0.01	0.1%
ER14	20	<0.01	<0.1%
ER15	20	<0.01	<0.1%
ER16	10	<0.01	<0.1%

ID	Applied CLo (kg N/ha/yr)	Max. PC (kg N/ha/yr)	PC as % of CLo
ER17	20	<0.01	<0.1%
ER18	20	0.04	0.2%
ER19	10	<0.01	<0.1%
ER20	10	0.06	0.6%
ER21	20	0.01	0.1%
ER22	20	0.01	<0.1%
ER23	20	<0.01	<0.1%
ER24	10	0.01	0.1%
ER25	20	0.01	0.1%
ER26	20	<0.01	<0.1%
ER27	10	<0.01	<0.1%
ER28	20	0.01	0.1%
ER29	20	<0.01	<0.1%
ER30	20	0.01	<0.1%
ER31	20	<0.01	<0.1%
ER32	10	<0.01	<0.1%
ER33	20	<0.01	<0.1%
ER34	20	<0.01	<0.1%
ER35	10	<0.01	<0.1%

Table D-19
TS & TN Cumulative OM – Impacts on Acid Critical Loads

ID	Applied CLo CLmaxN (kg_{eq}/ha/yr)	Max. N PC (kg_{eq}/ha/yr)	PC as % of CLo
ER1	5.07	<0.01	<0.1%
ER2	1.73	<0.01	<0.1%
ER3	5.07	<0.01	<0.1%
ER4	8.67	<0.01	<0.1%
ER5	5.07	<0.01	<0.1%
ER6	5.07	<0.01	<0.1%
ER7	5.07	<0.01	<0.1%
ER8	8.67	<0.01	<0.1%
ER9	5.07	<0.01	<0.1%
ER10	8.67	<0.01	<0.1%
ER11	5.07	<0.01	<0.1%
ER12	5.07	<0.01	<0.1%
ER13	2.08	<0.01	<0.1%

ID	Applied CLo CLmaxN (kg_{eq}/ha/yr)	Max. N PC (kg_{eq}/ha/yr)	PC as % of CLo
ER14	5.07	<0.01	<0.1%
ER15	5.07	<0.01	<0.1%
ER16	8.68	<0.01	<0.1%
ER17	5.07	<0.01	<0.1%
ER18	5.07	<0.01	<0.1%
ER19	8.67	<0.01	<0.1%
ER20	8.67	<0.01	0.1%
ER21	5.07	<0.01	<0.1%
ER22	5.07	<0.01	<0.1%
ER23	5.07	<0.01	<0.1%
ER24	8.66	<0.01	<0.1%
ER25	5.07	<0.01	<0.1%
ER26	5.07	<0.01	<0.1%
ER27	8.68	<0.01	<0.1%
ER28	5.07	<0.01	<0.1%
ER29	5.07	<0.01	<0.1%
ER30	5.07	<0.01	<0.1%
ER31	5.07	<0.01	<0.1%
ER32	8.68	<0.01	<0.1%
ER33	5.07	<0.01	<0.1%
ER34	5.07	<0.01	<0.1%
ER35	2.08	<0.01	<0.1%

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