ENVIRONMENT
& HEALTH

CYRUSONE 4 AND 5
AIR QUALITY ASSESSMENT

Project name	CYRUSONE 4 AND 5
Project no.	1620011380
Recipient	UK Environmental Agency
Document type	Technical Note
Version	01
Date	12/11/2021
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Approved by	G. Harker, R. Wood
Description	CyrusOne UK4 Limited - EPR/EP3508PS/A001 additional information/officiations

CONTENTS

Introduction

This report provides additional information to respond to the Environment Agency's (EAs) notice requesting further information on the Environmental Permit application EPR/EP3508PS/A001 dated 18th October 2021.

This report should be read in conjunction with the original dispersion modelling report (hereafter referred to as 'original report') submitted with the application (Ramboll CyrusOne 4 and 5 Data Centres Air Quality Assessment, No 16900138635 dated 03/03/2021). The responses have been prepared in line with the request to not reference information already provided but to provide a succinct, complete and simplified version of required response.

As detailed in the responses below, the testing regime, and consequent assessment scenarios, have been modified since the original application and report. This report, therefore, replaces section 5 Assessment of Impacts of the original report. Appendix B of this report replicates Section 5 with updated results is in accordance with the revised scenarios and additional request from the Environmental Agency.

Question 1 Model Input files

Question

Could you please provide the model input files that accompany your air quality modelling assessment please. This is so that we can complete a full audit of the work that has been submitted.

Model files

The model input files that accompany this technical note assessment are provided as a compressed file named CyrusOne4_5_Model_Files.

Question 2 Note 1 School as a Receptor

Question

The following are the key issues with regards to the air quality modelling work that need to be addressed before we can begin to look at it. Further issues may become evident when a detailed audit is undertaken after duly making. This may necessitate further remodelling work to be completed. As remodelling work is necessary the two more technical points below should be taken into account.

NOTE 1: It is stated in the report that the annual load bank test (presuming this is represented through the 4 generator testing scenario), will be undertaken during the school holidays and this the school is not considered as a receptor. We would disagree with – I this as it is possible the school could still be used e.g. for school holiday clubs. This should be taken into account when undertaking any re-modelling work.

Response

Each data centre has been granted planning permission separately by Slough Borough Council (SBC) (planning application reference P/00730/087 and P/00730/091), where the generators are not allowed to be tested during school term time between the hours of 09h00 and 15h00. The restriction on the testing is a planning condition and therefore this has been taken into account in the model set up (as explained below).

The school site is considered to be a receptor and the results for the school were presented in the original report. it is not the case that the school is not a receptor outside of term time, rather, there is a lower probability of it being occupied during this period. Additional human health specific receptor locations have been modelled, including three locations at the school and the results have been presented in this response.

Question 2 Note 2 Nitrogen Monoxide (NO)

Question

NOTE2: Where there are exceedances of AEGL-1 the modelling report should also assess against short-term nitrogen monoxide (NO), as an AEGL-1 exceedance could also result in an exceedance of NO. It should be assumed that 90% of NO_x is NO which is a worst-case assumption.

Response

We have provided the requested NO results although we consider this an unusual request as NO would not normally be considered a pollutant of concern. The Environment Agency published Environment Assessment Levels for NO are 310 µg/m^3 as an annual average and 4,400 µg/m^3 as an hourly average. Given the relative value of the annual mean EAL compared to that for NO_2, then consideration has only been given to the hourly mean objective.

The requested conversion factor for NO_x to NO is indeed a worst-case as it effectively assumes no oxidation of NO in the atmosphere. As the normal worst-case assumption for NO_2 for an hourly average is a 35% conversion (which has been applied for NO_2 in this assessment); the two worst case scenarios cannot occur together.

Question 2 a. Emission Parameters

Question

Table 1.2 should provide full details of the all the emission parameters. The table only includes the calculated emission rate and volumetric flow at reference conditions. Please provide the following so that we can audit the report:

Stack location (grid reference), Stack height, Exit diameter, Exit temperature, Actual moisture, Actual O2, Efflux velocity, Volumetric flow rate actual. Details of any source terms that vary with time (where relevant).

Response

The requested information is summarised below and is also contained within the modelling files provided in response to Question 1. The parameters stated are replicated across all flues in the assessment.

Table 5.1 Flue Parameters

Parameter	
Flue/Stack Height (m)	16.5
Flue diameter (m)	0.5
Flue exit Temperature (°C)	470
Actual flue volumetric flow (m^3/s)	8.2
Normalised flue volumetric flow (Nm^3/s, dry 5% O_2)	2.2
Normalised flue volumetric flow (Nm^3/s, dry 15% O_2)	5.9
Calculated O_2 (%)	7.8
Calculated water content (%)	10

Table 5.2: Flue Emissions

Parameter	Normalised Emission (mg/Nm^3 @ 5% O_2)	Normalised Emission (mg/Nm^3 @ 15% O_2)	Actual Emission (g/s)
NO_x	2000	742	4.44
Parameter	Emission (g/BHP-hr)*		Actual Emission (g/s)
SO2	0.11		0.10
CO	0.6		0.59
PM	0.06		0.06
* Full standby 3403 BHP (@ 1500 RPM (50 Hz))			

The data sheets provide information on the emission rates of pollutants in g/BHP-hr and also for NO_x in terms of mg/Nm^3. Exhaust gas flowrate for the engine was also provided wet at actual oxygen and dry at 5% oxygen which enables the oxygen and water vapour content of the exhaust to be back calculated.

Table 5.3: Flue Locations

Source name	X (m)	Y (m)
Cyrus4 1A	495170.9	180677.9
Cyrus4 1B	495169.9	180676.5
Cyrus4 1C	495171.8	180676.6
Cyrus4 1D	495171.1	180675.7
Cyrus4 2A	495154.7	180653.0
Cyrus4 2B	495153.7	180653.6
Cyrus4 2C	495155.1	180654.1
Cyrus4 2D	495154.4	180654.8
Cyrus4 3A	495298.5	180583.0
Cyrus4 3B	495299.3	180584.0
Cyrus4 3C	495298.4	180584.7
Cyrus4 3D	495297.5	180583.4
Cyrus4 4A	495281.3	180560.8
Cyrus4 4B	495282.3	180560.1
Cyrus4 4C	495282.0	180561.9
Cyrus4 4D	495283.2	180561.0
Cyrus5 1A	495413.3	180540.9
Cyrus5 1B	495414.1	180540.1
Cyrus5 2A	495405.7	180531.1
Cyrus5 2B	495406.9	180530.3
Cyrus5 3B	495399.8	180520.2
Cyrus5 3A	495398.9	180521.1
Cyrus5 4B	495393.0	180511.3
Cyrus5 4A	495391.8	180511.9
Cyrus5 5A	495346.6	180496.7
Cyrus5 5B	495347.7	180496.3
Cyrus5 6B	495340.7	180486.8
Cyrus5 6A	495339.6	180487.1
Cyrus5 7B	495305.7	180501.1
Cyrus5 7A	495306.2	180501.9

Source name	X (m)	Y (m)
Cyrus5 8A	495305.2	180502.7
Cyrus5 8B	495304.4	180502.1

Question 2 b. Scenarios

Question

It appears that 3 model scenarios have been run (Emergency, Single generator and Four generator). For clarity, for each scenario could you set out:

- how many engines were included;
- the period of operation for each engine over the met year (continuous or factored down) and;
- explain why the 2 maintenance/testing model scenarios are representative of all of the actual maintenance/testing that is undertaken (monthly off-load, full rated electrical load bank and black building test). Additional model runs should be undertaken if the 2 model scenarios are not considered representative.

Some of this is set out in the modelling report. Please do not reference what has already been provided in your response. Please provide a succinct, complete and simplified version please.

Response

The engine testing scenarios have been modified since the original application and are summarised below.

It is important to note, however, that the primary infrastructure for the two sites (CyrusOne 4 and CyrusOne 5) is never concurrently tested. There will always be separation of the servicing, so all the below maintenance/testing applies to both buildings independently, i.e., the maintenance/testing regime applies to both buildings but the engines from CyrusOne 4 and CyrusOne 5 are never tested at the same time.

1. Monthly off load engine runs. This will be carried out 10 months out of 12 in each calendar year. This test will be conducted on a singular engine only at any one time and will include an engine running time of circa 15-30 minutes maximum. When an engine test is complete and the engine is offline, the team will then proceed to the next engine. These tests would be carried out between core office hours so between 0900 and 1700.
2. OEM servicing. This is anticipated to be a twice-yearly service visit. The scope of service varies but each will require an engine run as per the off-load testing above. Therefore, this will occur 2 months out of 12. This will again be a singular engine at any one time and engine run time is expected to be circa 30-60 minutes depending on service scope. These tests would be carried out between core office hours so between 0900 and 1700.
3. Load Bank Testing. This will occur once per year. This test will again only be conducted on a single engine at any one time. Expected running time at design load is 60 minutes. These tests would be carried out between core office hours so between 0900 and 1700.
4. Mains Failure Testing. This test is not centred around the engines, however it will require them to run for circa 60-90 minutes. This test is conducted once per year and will require all engines to run

and support building load simultaneously for the duration of the test. This is the only test in each year where we will have more than one engine running in a controlled manner. This test will again be scheduled for core office hours.

The scheduling is designed to reduce the number of engines online and all running times are at the minimum duration to achieve the requirements of the testing scope. The above testing regime can therefore be summarised as follows:

1. Single generator run off-load for 30 minutes 10 times a year (total 5 hours a year per generator);
2. Single generator run off-load for 60 minutes 2 times a year (total 2 hours a year per generator);
3. Single generator run on-load for 60 mins minutes once a year (total 1 hour a year per generator); and
4. All engines running at either CyrusOne 4 or CyrusOne 5 for 90 minutes once a year.

Each data centre has been granted planning permission separately by SBC (planning application reference P/00730/087 and P/00730/091). Each permission requires that the generators are tested in accordance with the regime provided in support of the planning application and has the same constraint on the allowable testing regime for the generators:

- Testing shall be carried out Monday to Friday between 07h00 and 18h00 excluding bank holidays.
- No testing is allowed during school term time between the hours of 09h00 and 15h00 due to the presence of the primary school to the south of the site.

As the tests would be carried out between core office hours between 09h00 and 17h00; and the planning permission allowable testing regime is from 07h00 to 09h00 and 15h00 to 18h00; the testing regime time window would be between 15h00 to 17h00.

For CyrusOne 4 flues are grouped together in four per stack (see question 1 modelling files set up). For CyrusOne 5 there are six stacks with two flues and one stack with four flues.

In modelling terms, this leads to the following scenarios:

- Scenario1: Single generator tested for 60 minutes (worst case for the single generator testing) for a maximum of 8 hours per year (taking the maximum time specified) with the following model set up:
    - For CyrusOne 4, the total testing hours per stack is 32 hours per year.
    - For CyrusOne 5, the total testing hours per stack with four flues is 32 hours per year and for the stacks with two flues is 16 hours per year.
    - A time varying emission file was used to limit the emissions between 15h00-17h00 time periods on weekdays for all months of the year except August (i.e. all months when there would be term time restrictions on the testing).
    - For the hourly testing:
        - the model was run using one representative emission point (i.e. flue) per stack location and the highest results reported. For CyrusOne 4 there were four emission points modelled representing each stack location (i.e. Cyrus4 Stack 1 to 4). For CyrusOne 5 a similar approach was adopted with three stacks paired up to give four emission points modelled (Cyrus5 Stack 1 to 7).

    - For NO_x and NO_2 annual mean impacts, the predicted concentrations are factored by the operating hours per year. For CyrusOne 4 the predicted concentrations were factored for 32 hours. For CyrusOne 5 one stack (with four combined flues) would operate for 32 hours and six stacks (with two combined flues) would operate for 16 hours; however, as a worst case the results all CyrusOne 5 stacks were factored by 32 hours operation.

- Scenario 2: 16 generators running for 90 minutes once a year at CyrusOne 4 or CyrusOne 5 (point 4 above representing mains failure testing) with the following model set up:
    - Although the 90-minute test could be carried out during the available hours during term time (15h00 to 17h00), given the scenario 1 testing regime requirements, this test is assumed to be carried out during August outside of school term restrictions.
    - A time varying emission file was used to limit the emissions between 09h00-17h00 time periods on weekdays for the month of August (i.e. when no school term restrictions would apply).
    - At an individual receptor, this scenario would be expected to produce higher ambient concentrations than the impact from a single generator and the maximum impacts will be in different locations.

- Scenario 3: Emergency scenario covering all 32 generators running together to represent complete grid failure.
    - The modelling has been undertaken to determine the allowable operating hours in an emergency for the probability of exceeding the hourly mean NO_2 objective to be 1%, following the Emissions from Generators guidance published by the EA.
    - This scenario will produce the highest predicted concentrations in the environment, again in different locations to the individual or grouped testing.

In all cases the modelling has been run using a full year's worth of meteorological data. For hourly mean NO_2 concentrations, the probability of exceeding the 1-hour mean objective is determined. In the case of the emergency scenario, the maximum number of hours that the generators can operate before a 1% probability of exceeding the 1-hour mean objective is determined and the calculated number of hours used to determine annual mean impacts at receptor locations.

Question 2 c. Maximum Result Locations

Question

Provided the grid reference for your 'maximum residential area' and the 'maximum school area' locations.

Response

The maximum results at sensitive receptors, at either residential or school areas, for each individual set of scenarios are identified in this assessment report in Appendix B. The location of maximum predicted concentration within each area is shown on the figures and the grid reference provided in the tables.

Note 2 d. Extent Model Area and Terrain

Question

Provide a plan to indicate the extent of the modelled area with terrain contours.

Response

The terrain in the vicinity of the development is flat with slopes less than 10%, and therefore terrain effects have not been included within the modelling.

Extension of the modelled area contour grid is showed in Figure 1. The receptor grid was between 495000 180200 and 495700 180900, i.e. 700m square with a spacing of 7m at a modelled height of 1.5m.

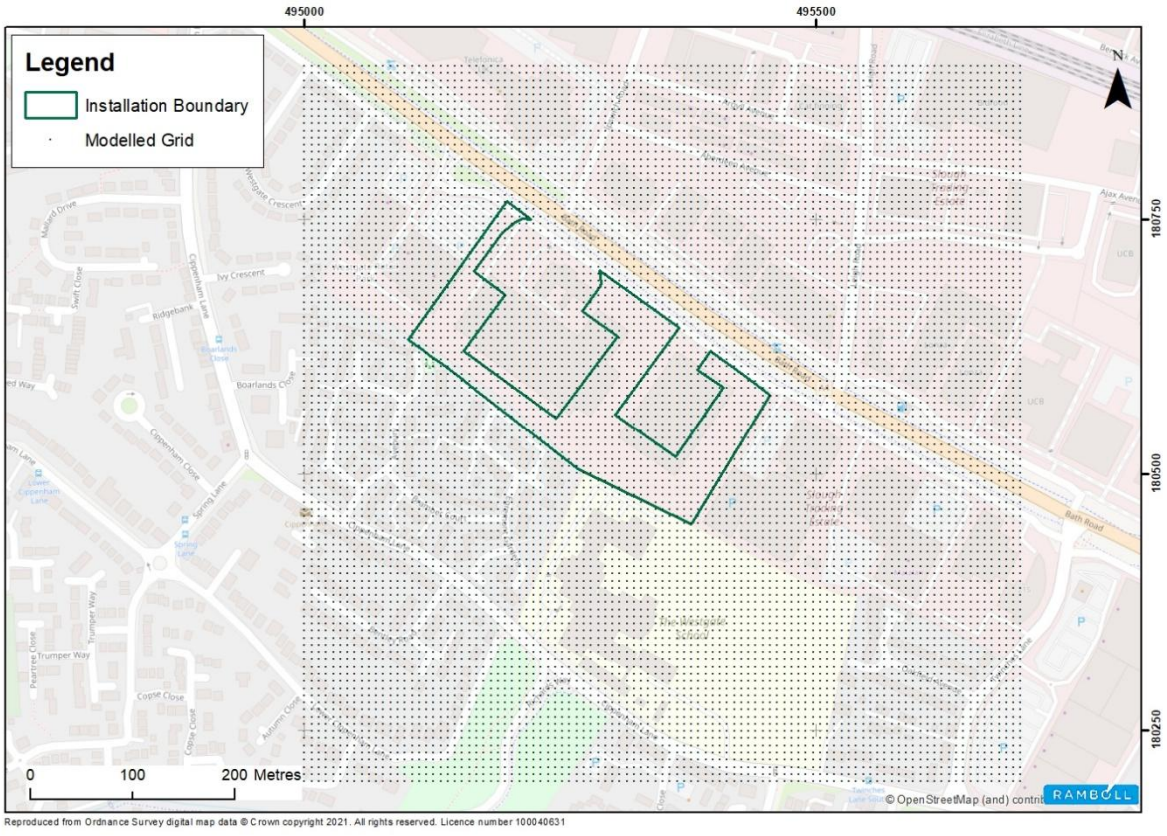


Figure 1: Air Quality Model Grid

Question 2 e. Meteorological Data

Question

With regards to the meteorological data used.

What is the source of the met data used, (e.g. UK Met Office)
Describe the data quality and uncertainties relating to any alternative meteorological data.
Detail the format of the meteorological data – hourly sequential or long-term statistical.

Response

The dispersion modelling has been undertaken with five years of meteorology data 2016 to 2020 inclusive, from Heathrow Airport. The data were obtained from National Centres for Environmental Information National Oceanic and Atmospheric Administration[1].

Heathrow meteorological station, located approximately 12.8 km to the south east of the Site at an elevation of 25 m, is the closest meteorological station to the site. The difference in elevation in comparison to the site is -8.3 m as the site elevation is approximately 33 m. Heathrow meteorological data are therefore considered representative of the site.

[1] https://www.ncei.noaa.gov/access/search/data-search/global-hourly?a-station=Stations:03772099999%257CHEATHROW&stations=03772099999

The missing data is provided for each year in the Table 9.1 with wind roses of each meteorological year presented in Table 9.2. The overall maximum missing data for the meteorological data were 2.3% and therefore the data is considered suitable for modelling purposes.

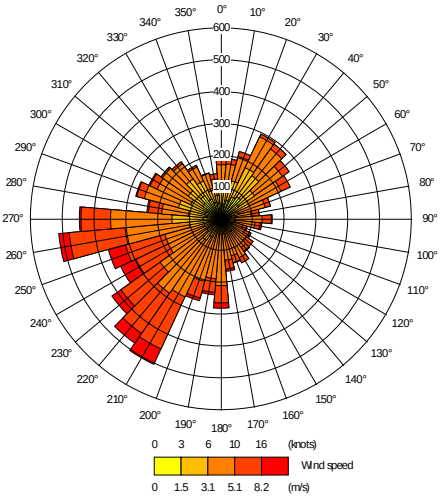
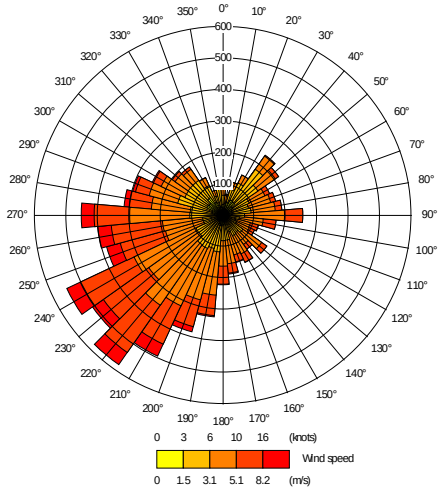
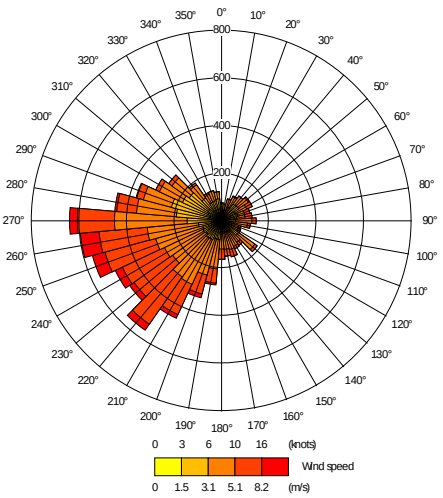
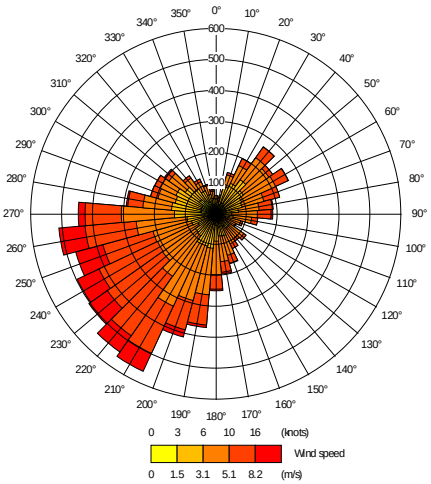
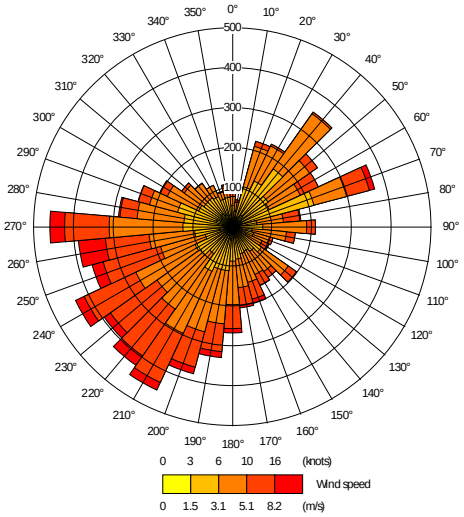
The meteorological data are all hourly sequential.

Table 9.1: Heathrow Airport Meteorological Data[2]

Year	Elevation (m)	Missing data temperature (%)	Missing data cloud cover (%)	Most frequent wind direction (deg)	Missing data wind speed (%)	Missing data overall (%)
2020	25	0	0	260	0	0
2019	25	1.1	1.1	260	1.1	1.1
2018	25	2.3	2.3	260	2.3	2.3
2017	25	0	0	260	0	0
2016	25	0.3	0.3	260	0.3	0.3

[2] ADM, 2021. https://www.aboutair.com/met-data-search/

Table 9.2: Heathrow Airport Wind Rose 2016-2020

Wind rose	Wind rose
 2016	 2019
 2017	 2020
 2018	

The reported results are the maximum from any of the 5 years' worth of meteorological data that have been modelled.

Question 2 f. Background Concentrations

Question

State the background concentrations used for all pollutants assessed in the modelling report.

Response

Background concentrations for each pollutant were provided in the original report in Section 4.3 Background Concentrations and in results tables for NO_x, NO_2 and PM_{10}. In line with Environment Agency guidance[3], background concentrations are only relevant where the PC exceeds the thresholds for significance. The backgrounds for CO and SO_2 have therefore not been provided. Moreover, as CO and SO_2 are no longer pollutants of concern in the UK, Defra has not published revised background data for these pollutants since 2001[4].

The closest and most sensitive receptor locations to the site are the residential areas to the south of Bath Road and the school. These locations are not located in close proximity to Bath Road and are expected to have concentrations typical of urban background locations. The urban background monitoring site SLH4 is located within an AQMA and approximately 15m north of the A4 Bath Road. Measured concentrations at SLH4 are therefore likely to be higher than those in the identified receptor locations and therefore conservative for the assessment. An annual mean baseline NO_2 concentration of 26.4 µg/m^3 has therefore been used for the assessment.

For hourly mean concentrations, in accordance with Environment Agency guidance, a value of twice the annual mean has been used, i.e. 52.8 µg/m^3. In order to assess the number of operating hours equal to a 1% chance of exceeding the 1 hour mean objective, the modelling has used a NO_2 predicted environmental concentration of 200 µg/m^3. With a baseline of 52.8 µg/m^3, the allowable NO_2 process contribution (PC) (i.e. from the development) is 147.2 µg/m^3 which is equivalent to a NO_x concentration of 420.6 µg/m^3 assuming a conversion factor of 0.35 for NO_x to NO_2.

Consistent with NO_2, for PM_{10} the annual mean baseline concentration has been chosen as the value from SLH4, i.e. 18.3 µg/m^3.

Backgrounds are below the relevant objective or critical level, except for the LWS Railway Triangle 2 and Jubilee River and Dorney Wetlands where the background exceeds the critical level.

Table 9.1: Backgrounds

Location	Source	Annual Mean (µg/m3)		
		NO_x	NO_2	PM_{10}
Site and environs	SLH4 Station	-	26.4	18.3
Burnham Beeches	Defra 2021 Background	16.5	-	-

[3] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screening-for-protected-conservation-areas
[4] https://uk-air.defra.gov.uk/data/laqm-background-home

Chiltern Beechwoods		16.4	-	-
Windsor Forest 1		15.1	-	-
Windsor Forest 2		16.5	-	-
South West London 1		14.7	-	-
South West London 2		19.9	-	-
Haymill Valley LNR		22.4	-	-
Dorney Common and Cress Brook		27.2	-	-
Railway Triangle 1		27.6	-	-
Railway Triangle 2		31.1	-	-
Jubilee River and Dorney Wetlands 1		31.1	-	-
Jubilee River and Dorney Wetlands 2		23.1	-	-
Objective / Critical Level		30	40	40

Question 2 g. PC and PEC

Question

Present the PC and PEC for all pollutants for short and long term assessment criteria in the results tables in the modelling report, adding further tables as necessary.

For ecological receptors there is no assessment of the impact of long term criteria for any of the pollutants. For human health receptors there has been some assessment of long term criteria.

We would advise two model runs to assess long term impacts: one containing all annual maintenance/testing combined and a second containing all annual maintenance/testing combined plus an emergency outage scenario. This should be assessed for long term criteria for all of the pollutants. All results should be tabulated and presented in the report.

Response

As noted in the response to Question 2f, background concentrations and therefore PECs are only relevant where the PCs are potentially significant, and therefore PECs were only provided for relevant pollutants. It should also be noted that the only pollutant that can have potentially significant environmental impacts is NO_x as the emissions of NO_x are approximately 40 times those of the other pollutants emitted. The PECs for NO_x or NO_2 have been added to this assessment and presented in Appendix B.

Ecological results were presented in the original report, where Table 5.19 presented the annual mean NO_x concentrations. Given the limited operating hours of the generators per year none of the other pollutants will have significant impacts at the ecological receptors. This assessment therefore presents additional results for the short and long term assessment criteria on ecological receptors.

In terms of individual model runs, it is not possible to combine the modelling of an individual generator test with those from the operation of 16 generators or 32 generators. We have therefore presented results at all receptor locations from the testing and emergency scenarios based on the operating hours during testing and an emergency. These results will be worst case, as the maximum impacts at each receptor for each scenario are unlikely to occur together.

If the generators are required to run in a power outage emergency scenario, it would likely negate the need for the equivalent maintenance/testing run. The combined maintenance/testing plus an emergency outage scenario would therefore not be relevant or representative of actual operational conditions.

Question 2 h. Acceptable Emissions

Question

Human Health

Under the emergency scenario the hourly NO_2 concentration is above the Ambient Air Directive Limit (AADL) but below the AEGL. Provide a full and reasoned justification why these emissions are considered acceptable.

Response

The AADL for 1 hour mean NO_2 concentrations is a 99.79^{th} %ile value (i.e. allowing 18 exceedances per year) and under emergency operation the assessment criterion is based on a 1% chance of exceeding this value by using the hypergeometric probability function. This is in accordance with Environment Agency guidance on assessing emissions from data centre generators.

The assessment has calculated the number of hours that the emergency generators could operate before there is a 1% probability of exceeding the objective. The calculated number of hours (37) is far in excess of the likely number of hours that the generators will every have to operate in the event of a total power loss to the site. These emissions are therefore considered acceptable as they meet the criteria which the Environment Agency has provided for such emergency generating equipment.

Question 2 i. Sensitivity Analysis of Representative Human Health Receptors

Question

As there are exceedances then further sensitivity analysis should be undertaken considering a representative list of human receptors locations around the installation instead of using the maximum gridded output. We need to know the extent of any exceedances for across the modelled area to inform decision making during the determination of the application. The maximum residential area and maximum school are locations have been used but it does not appear that these relate to any actual receptor locations. Remodelling should be provided which includes a representative list of human receptors.

Response

The modelling has demonstrated that exceedances are unlikely in the event of an emergency. The school site and residential areas were referred to in the original report in relation to contour plots of the

results and the grid references were provided for the location of maximum concentrations in these areas.

As requested, individual receptor locations have been added at the closest residential and commercial use properties surrounding the site. The receptor locations are shown in Figure 2 and have been modelled at 1.5m height representing ground floor exposure. For the school, the receptors were also modelled at 4.5m height representing first floor exposure. Nonetheless, as the most impacted location changes according to the assessed scenario, the contour plots provide a clearer representation of the exposure across the school site and residential areas.

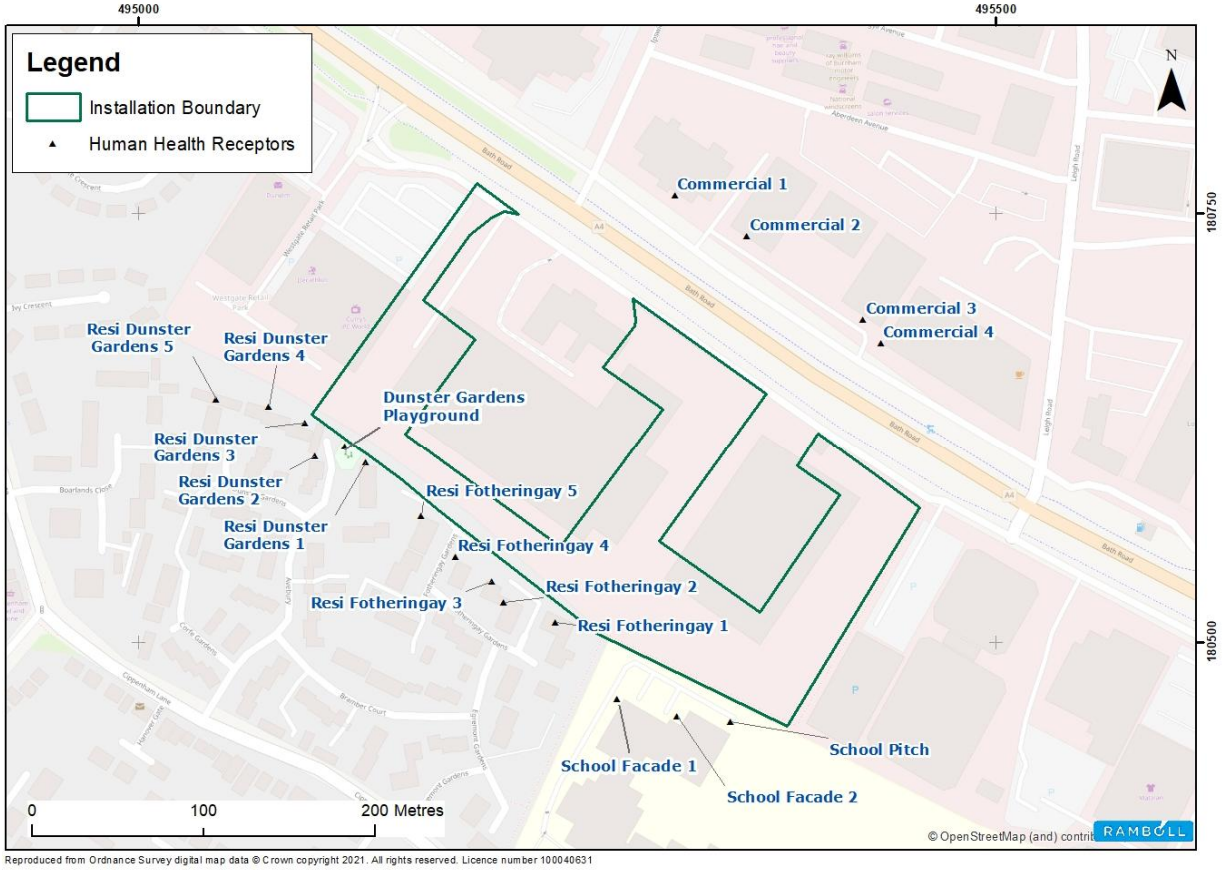


Figure 2: Air Quality Human Health Receptor Locations

Question 2 j. Maintenance/Testing Scenarios

Question

For the maintenance/testing scenarios the results are presented individually for CyrusOne 4 and CyrusOne 5. This in one installation and the results should be presented and assessed based on the installation as a whole (CyrusOne 4 and 5 considered together). The PCs/PECs should not exceed any emission limit (including AAD limits). This is a planned activity occurring every year exceedances will not be considered acceptable.

If the Process Contributions from CyrusOne 4 and CyrusOne 5 are added together then there will be exceedances during maintenance/testing for hourly NO_2 for all scenarios (single generator and four generator).

Set out your proposals (e.g. reduce number of hours of testing) for how it will be ensured that there is no environmental impact during any maintenance/testing scenarios. Re-modelling should be undertaken based on the proposals to demonstrate that there will be no environmental impact.

Response

As noted in the response to question 2b, the generators are not tested simultaneously. Whilst the application presents as a single installation due to their proximity, they will be operated as two distinct facilities and will be managed separately with avoidance of concurrent testing. The maximum predicted concentrations will also occur at different receptor locations as the emission points are spread across the site (with CyrusOne 4 to the east and CyrusOne 5 to the west). The PCs/PECs are not assessed against emission limits, rather they are assessed against ambient air quality assessment levels, and there are no exceedances of these.

The modelling has demonstrated that there are no exceedances of ambient air quality assessment levels (see the results in Appendix B). Due to the limited operation of the units, it is considered that this represents a demonstration of no environmental impact. Please advise if an alternative assessment should be applied.

Question 2 k. Ecological Receptors

Question

Ecological Receptors

After reviewing the receptor points included in the model there are 4 Local Wildlife Sites within the screening distance that have not been included. Dorney Common and Cress Brook, Jubilee River and Dorney Wetlands, Haymill Valley, Railway Triangle (off Stranraer Gardens).

Provide a justification for why these have not been considered and why the emissions from this data centre are not going to have an impact on these receptor points. If a suitable justification is not provided then you will need to remodel to assess the impacts on these sites.

Response

As per the Environmental Agency guidance[5], a review of the protected conservation areas within 10km for special protection areas (SPA), special areas of conservation (SACs) and Ramsar sites has been carried out and no further conservation areas have been identified.

Within 2km of the site, Haymill Valley local nature reserve (LNR) and local wildlife site (LWS) was included the original assessment as the nearest ecological receptor. Dorney Common and Cress Brook, Jubilee River and Dorney Wetlands, Haymill Valley, Railway Triangle (off Stranraer Gardens) LWSs have been added to this assessment. Figure 2 shows the location of the conservation sites within 2km of the site.

[5] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screening-for-protected-conservation-areas

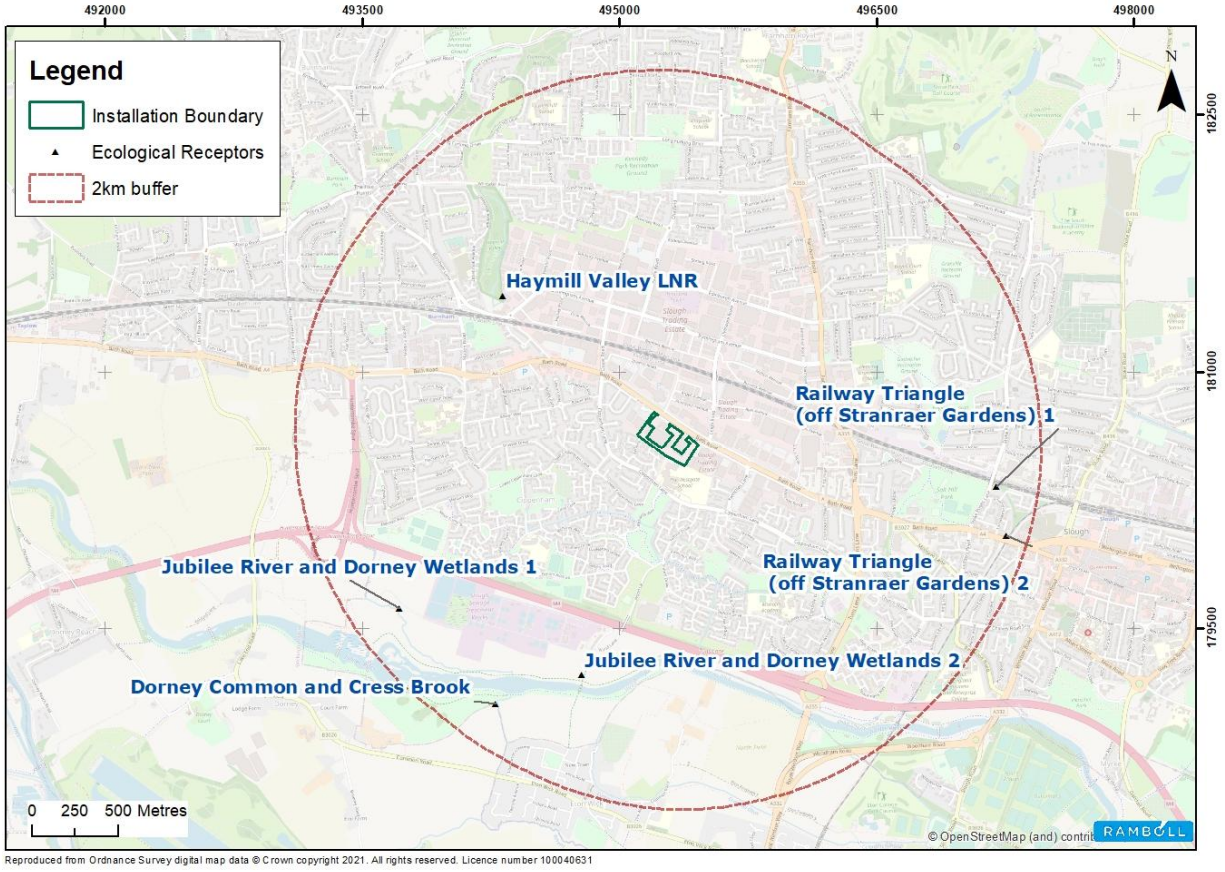


Figure 2: Ecological Receptor Locations

Question 2 i. Acid and Nitrogen Deposition

Question

No results are presented for acid deposition or nitrogen deposition for any of the ecological receptor points. As there are European sites within the screening distance numerical values are required for when we consult with Natural England. The model should be rerun to assess against these criteria.

Response

As explained in the original report, N deposition and by extension, acid deposition will be insignificant by reference to the relative impact on NO_x concentrations. However, the information has been provided as requested.

Questions 3-7

A response to these points was provided in our letter dated 2nd November 2021.

APPENDIX A
MODELLING SET UP

Scenarios and Operational Hours

The scenarios and operational profile are described above in response to question 2b.

Special Treatments

Conversion ratios of 70% and 35% have been applied for the conversion of NO_X to NO_2 for annual and hourly mean concentrations in accordance with the EA Conversion Ratios for NO_x and NO_2. For conversion of NO_x to NO a conversion factor of 90% has been applied.

Buildings Effects

Tall buildings can have a substantial impact on the dispersion of pollutants from stacks, as a result of building downwash i.e. pollutants being drawn down in the wake of a building, giving rise to high concentrations close to the base of the buildings. ADMS5 is able to take account of this potential impact by the inclusion of rectangular buildings in the model. The buildings included within the modelling are provided in Table A1 below and the model layouts are shown pictorially.

Table A1: Buildings Dimensions

Name	X (m)	Y (m)	Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
CyrusOne 4 DataHall	495226.9	180618.1	15.5	63.2	154.0	36.0
CyrusOne 5	495357.3	180556.1	16.5	63.3	94.8	125.0
Office	495286.4	180630.2	12.5	30.5	35.9	35.0
227BathRd1	495234.3	180695.1	17.0	17.8	35.0	125.0
227BathRd2	495263.2	180683.6	17.0	44.5	19.1	125.0
225BathRd	495113.2	180702.6	6.0	65.1	56.9	127.4
School1	495287.4	180448.3	6.0	34.8	22.9	121.0
School2	495315.2	180435.8	6.0	24.7	34.0	121.0
School3	495263.9	180411.9	6.0	65.6	31.0	211.0
cladding1	495323.6	180512.4	13.0	15.0	50.0	35.0
cladding2	495389.2	180534.1	13.0	13.7	50.0	125.0
Guru3	495454.4	180455.8	8.0	57.0	72.1	121.2

Name	X (m)	Y (m)	Height (m)	Length (m) / Diameter (m)	Width (m)	Angle (Degrees)
Guru Parking	495410.0	180468.6	6.0	32.6	62.5	300.0
Guru1	495485.7	180517.1	8.0	47.8	47.3	119.2
Guru2	495470.5	180493.0	8.0	10.0	24.2	32.3

Figure A1: Modelled Buildings and Point Source Layout

APPENDIX B
Assessment of Impacts

5. ASSESSMENT OF IMPACTS

5.1 Human Health Receptors

5.1.1 Emergency Operation

Nitrogen Dioxide

The number of hours that the emergency generators will need to be used in a power loss scenario cannot be predicted. The assessment therefore considers how many hours per year the facility could operate for a 1% and 5% chance of exceeding the objective.

During emergency operation, for a 1% probability of exceeding the 1-hour mean NO_2 objective, the 16 generators at both sites (32 generators) could operate simultaneously for 37 hours. Figure 5.1 shows the predicted 1% and 5% probability for 37 hours operation of all of the generators from both sites. The contours are the maximum results from any of the five years of meteorological data modelled and therefore do not represent the impacts from any one single year.

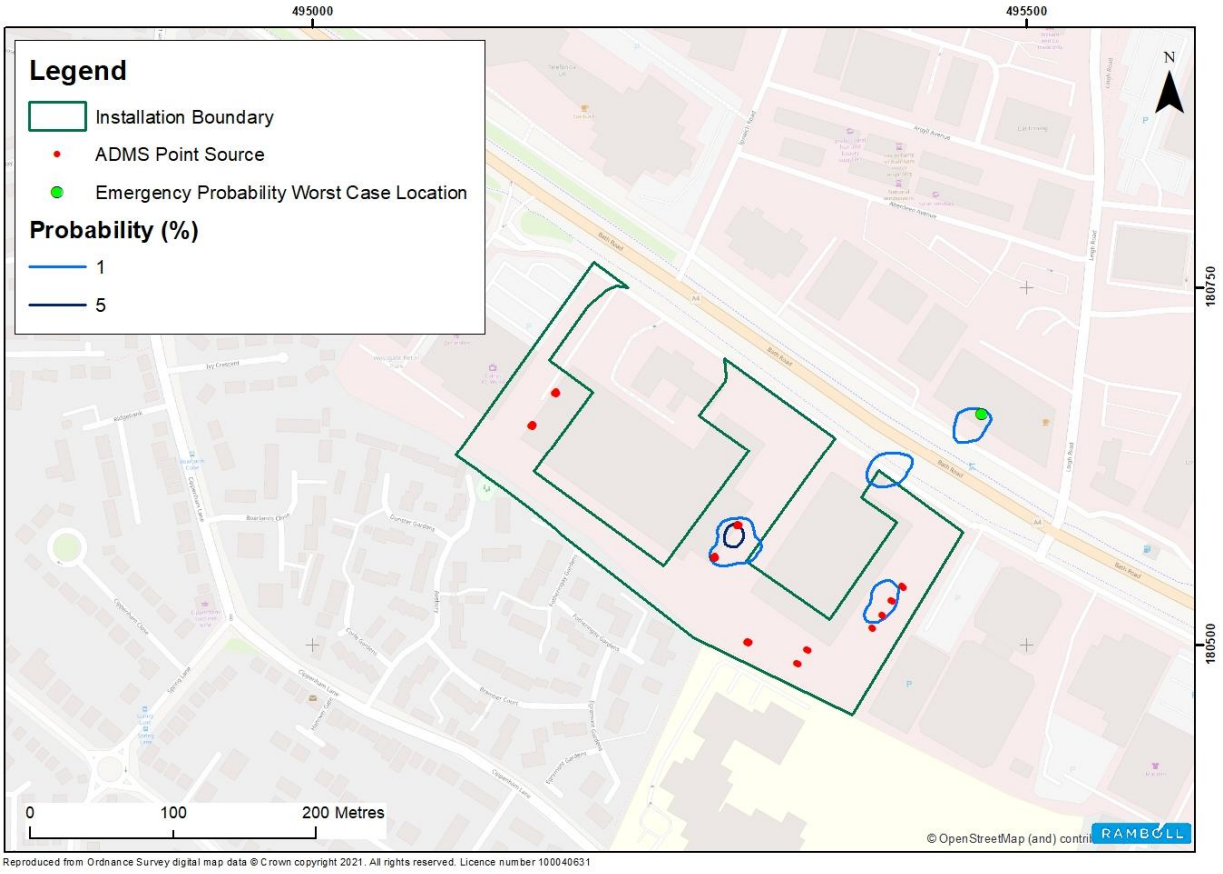


Figure 5.1: Predicted Probability of Exceeding 1 hour Mean NO_2 Objective of 37 hours operation (%)

Figure 5.1 shows that the 1% probability extends for a short distance outside the front of the site at a commercial/office location. The 5% contour is wholly within the site.

A period of 37 hours is far in excess of the likely time period that a full power outage would occur in the UK, and therefore it can be concluded that an exceedance of the hourly mean objective is highly unlikely.

A period of 37 hours has been used to calculate the annual average impacts in an emergency, where relevant.

Table 5.1 presents the predicted 100%ile hourly mean NO_2 concentration during an emergency results in relation to the DAQI and AEGL. Figure 5.2 shows the predicted 100%ile hourly mean NO_2 concentration during an emergency. The contours are the maximum results from any of the five years of meteorological data modelled and therefore do not represent the impacts from any one single year.

Table 0.1: Predicted 100th percentile NO_2 Concentrations for Emergency Operation ($\mu g/m^3$)

Receptor	Height (m)	1-hour average		
		$\mu g/m^3$	AEGL	DAQI Level
Grid Max 495266, 180473 (Figure 5.2)	1.5	1102	AEGL-1	10
School Facade 1 GF	4.5	663	Below AEGL-1	10
School Facade 1 1st	1.5	749	Below AEGL-1	10
School Facade 2 GF	4.5	413	Below AEGL-1	7
School Facade 2 1st	1.5	421	Below AEGL-1	7
School Pitch	1.5	578	Below AEGL-1	9
Resi Fotheringay 1	1.5	548	Below AEGL-1	9
Resi Fotheringay 2	1.5	473	Below AEGL-1	8
Resi Fotheringay 3	1.5	491	Below AEGL-1	8
Resi Fotheringay 4	1.5	492	Below AEGL-1	8
Resi Fotheringay 5	1.5	487	Below AEGL-1	8
Resi Dunster Gardens 1	1.5	470	Below AEGL-1	8
Resi Dunster Gardens 2	1.5	473	Below AEGL-1	8
Dunster Gardens Playground	1.5	481	Below AEGL-1	8
Resi Dunster Gardens 3	1.5	528	Below AEGL-1	8
Resi Dunster Gardens 4	1.5	534	Below AEGL-1	8
Resi Dunster Gardens 5	1.5	493	Below AEGL-1	8
Commercial 1	1.5	720	Below AEGL-1	10
Commercial 2	1.5	419	Below AEGL-1	7
Commercial 3	1.5	389	Below AEGL-1	6
Commercial 4	1.5	394	Below AEGL-1	10

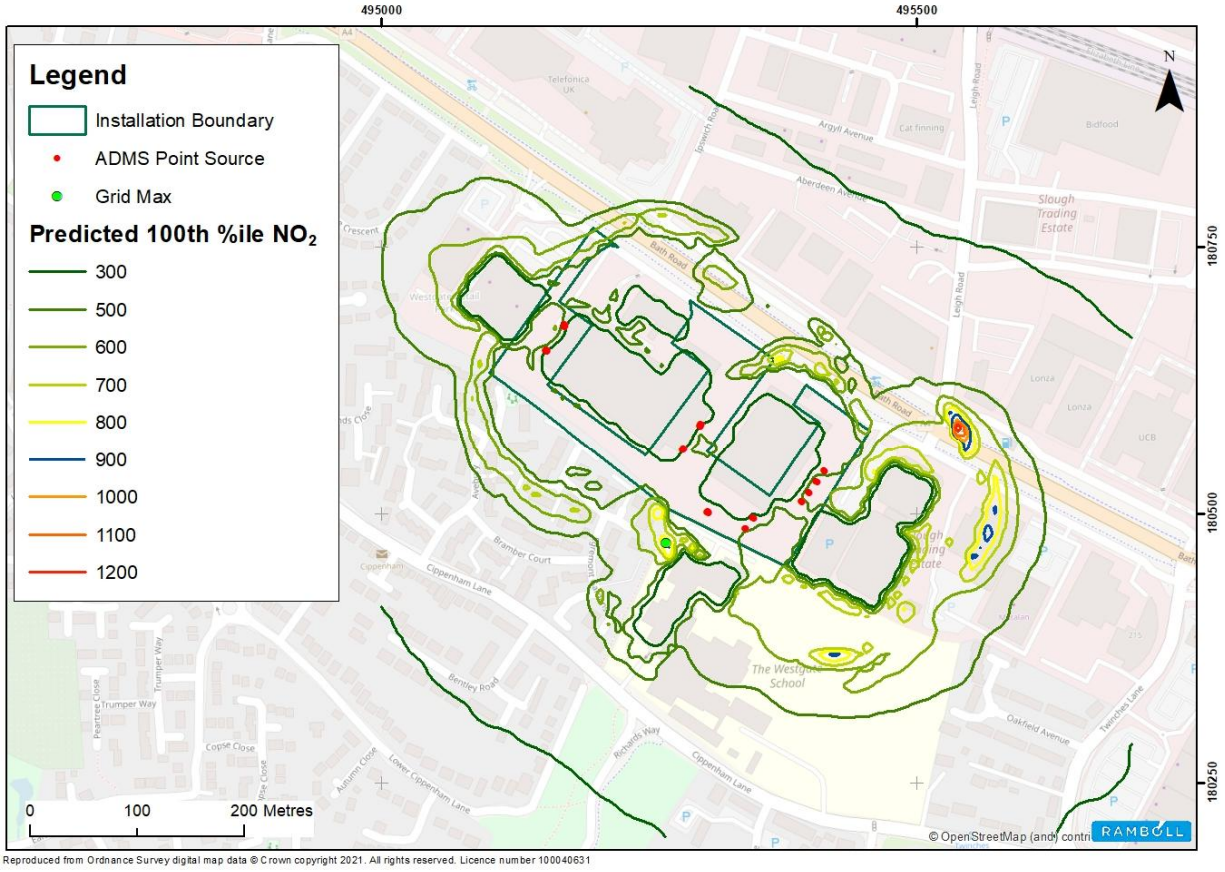


Figure 5.2: Predicted 100%ile Hourly Mean NO_2 Concentration During an Emergency.

The maximum predicted concentration occurs at one specific point to the north of the façade of the school building having concentrations at AEGL-1. For the remaining areas of relevant exposure, predicted 100%ile hourly mean NO_2 concentrations are below 900 µg/m^3 and therefore less than AEGL-1.

Table 5.2 presents the predicted 100%ile hourly mean NO concentration during an emergency assuming 90% conversion of NO_x to NO. All of the maximum concentrations are less than the EAL of 4,400 µg/m^3.

Table 0.2: Predicted 100th percentile NO Concentrations for Emergency Operation (µg/m^3)

Receptor	Height (m)	NO 1-hour average (µg/m^3)
Grid Max 495266, 180473 (Figure 5.2)	1.5	2836
School Facade 1 GF	4.5	1704
School Facade 1 1st	1.5	1925
School Facade 2 GF	4.5	1062
School Facade 2 1st	1.5	1084
School Pitch	1.5	1486
Resi Fotheringay 1	1.5	1408

Receptor	Height (m)	NO 1-hour average ($\mu g/m^3$)
Resi Fotheringay 2	1.5	1215
Resi Fotheringay 3	1.5	1263
Resi Fotheringay 4	1.5	1265
Resi Fotheringay 5	1.5	1253
Resi Dunster Gardens 1	1.5	1210
Resi Dunster Gardens 2	1.5	1217
Dunster Gardens Playground	1.5	1237
Resi Dunster Gardens 3	1.5	1357
Resi Dunster Gardens 4	1.5	1372
Resi Dunster Gardens 5	1.5	1268
Commercial 1	1.5	1850
Commercial 2	1.5	1076
Commercial 3	1.5	1001
Commercial 4	1.5	1014

Table 5.2 and Figure 5.3 shows the maximum annual mean NO_2 concentrations during an emergency for 37 hours operation.

Table 0.3: Maximum Predicted Annual Mean NO_2 Concentration

Receptor	EAL $\mu g/m^3$	Background Concentration $\mu g/m^3$	PC $\mu g/m^3$	PC as % of the EAL	PEC $\mu g/m^3$	PEC as a % of the EAL
Grid max	NA – maximum does not occur at relevant sensitive receptor to the annual mean objective					
School Facade 1 GF	40	26.4	0.2	0.4	26.6	66
School Facade 1 1st	40	26.4	0.2	0.4	26.6	66
School Facade 2 GF	40	26.4	0.2	0.4	26.6	66
School Facade 2 1st	40	26.4	0.2	0.4	26.6	66
School Pitch	40	26.4	0.1	0.3	26.5	66
Resi Fotheringay 1	40	26.4	0.2	0.4	26.6	66
Resi Fotheringay 2	40	26.4	0.3	0.6	26.7	67
Resi Fotheringay 3	40	26.4	0.3	0.8	26.7	67
Resi Fotheringay 4	40	26.4	0.3	0.7	26.7	67
Resi Fotheringay 5	40	26.4	0.3	0.7	26.7	67

Receptor	EAL µg/m^3	Background Concentration µg/m^3	PC µg/m^3	PC as % of the EAL	PEC µg/m^3	PEC as a % of the EAL
Resi Dunster Gardens 1	40	26.4	0.1	0.3	26.5	66
Resi Dunster Gardens 2	40	26.4	0.1	0.4	26.5	66
Dunster Gardens Playground	40	26.4	0.1	0.3	26.5	66
Resi Dunster Gardens 3	40	26.4	0.1	0.3	26.5	66
Resi Dunster Gardens 4	40	26.4	0.2	0.4	26.6	66
Resi Dunster Gardens 5	40	26.4	0.2	0.4	26.6	66
Commercial 1	40	26.4	0.5	1.1	26.9	66
Commercial 2	40	26.4	0.6	1.3	27.0	64
Commercial 3	40	26.4	0.7	1.6	27.1	63
Commercial 4	40	26.4	0.7	1.6	27.1	62

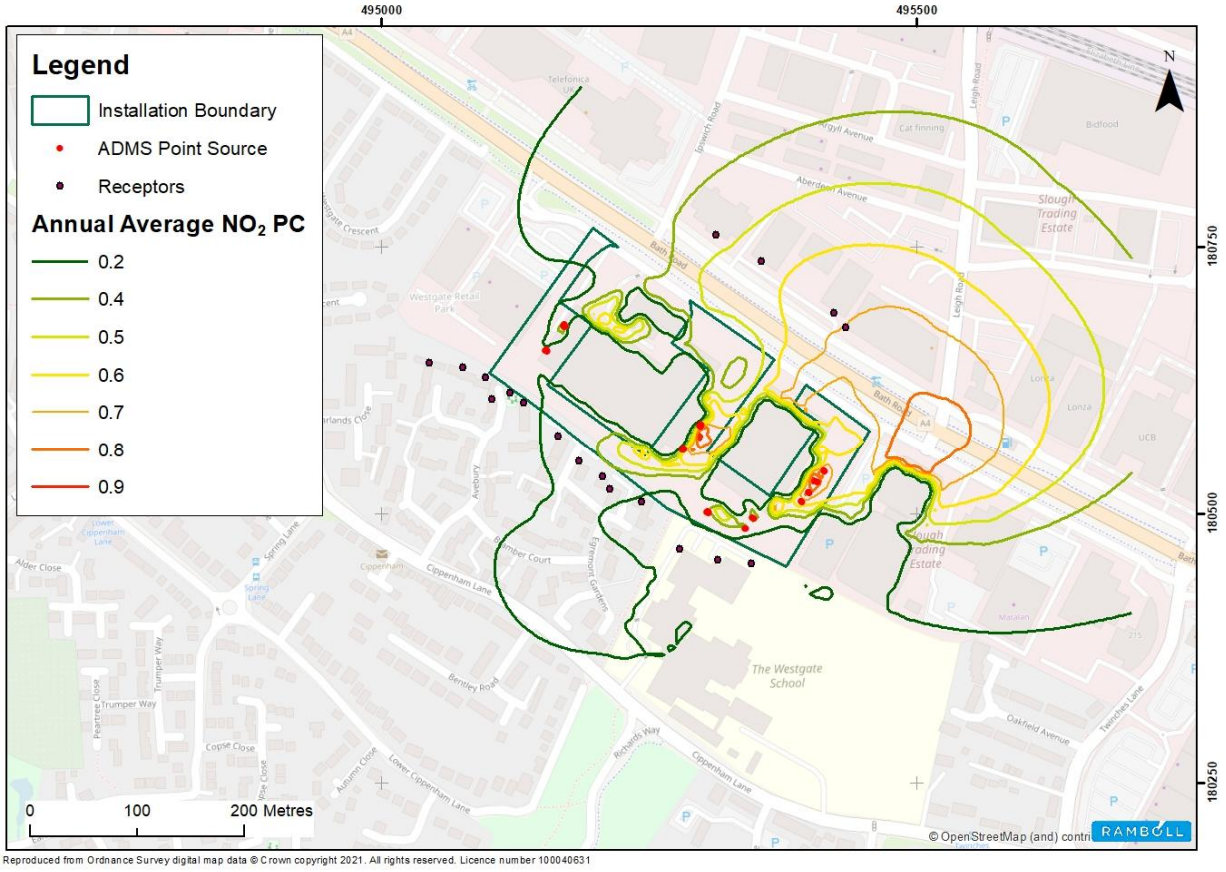


Figure 5.3: Predicted Annual Average NO_2 Concentration for 37h Emergency Operation ($\mu g/m^3$).

The contours are the maximum results from any of the five years of meteorological data modelled and are therefore do not represent the impacts from any one single year. The maximum PCs occur on site or at commercial use properties, which are not locations of relevant exposure for the annual average objective. The maximum PCs at locations of relevant exposure (i.e. the school and residential areas) are less than 0.3$\mu g/m^3$. The maximum offsite PEC will be less than 70% of the EAL.

PM_{10} and $PM_{2.5}$

The maximum daily 90.41th percentile process contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.4 for emergency operation. As the maximum operating hours in an emergency are only 37, the maximum predicted daily mean concentration is very unlikely to arise in practice.

Table 0.4: Maximum Predicted Daily 90.41th percentile PM_{10} Concentration

Receptor	EAL $\mu g/m^3$	Background Concentration $\mu g/m^3$	PC $\mu g/m^3$	PC as % of the EAL	PEC $\mu g/m^3$	PEC as a % of the EAL
School Facade 1 GF	50	18.3	2.5	5.0	20.8	41.6
School Facade 1 1st	50	18.3	2.9	5.7	21.2	42.3

Receptor	EAL µg/m³	Background Concentration µg/m³	PC µg/m³	PC as % of the EAL	PEC µg/m³	PEC as a % of the EAL
School Facade 2 GF	50	18.3	2.3	4.5	20.6	41.1
School Facade 2 1st	50	18.3	2.5	5.0	20.8	41.6
School Pitch	50	18.3	1.9	3.8	20.2	40.4
Resi Fotheringay 1	50	18.3	2.8	5.7	21.1	42.3
Resi Fotheringay 2	50	18.3	3.7	7.3	22.0	43.9
Resi Fotheringay 3	50	18.3	3.6	7.3	21.9	43.9
Resi Fotheringay 4	50	18.3	3.9	7.9	22.2	44.5
Resi Fotheringay 5	50	18.3	3.6	7.2	21.9	43.8
Resi Dunster Gardens 1	50	18.3	2.3	4.5	20.6	41.1
Resi Dunster Gardens 2	50	18.3	2.5	5.0	20.8	41.6
Dunster Gardens Playground	50	18.3	2.1	4.2	20.4	40.8
Resi Dunster Gardens 3	50	18.3	2.3	4.6	20.6	41.2
Resi Dunster Gardens 4	50	18.3	2.7	5.4	21.0	42.0
Resi Dunster Gardens 5	50	18.3	3.0	5.9	21.3	42.5
Commercial 1	50	18.3	5.6	11.2	23.9	47.8
Commercial 2	50	18.3	6.2	12.4	24.5	49.0
Commercial 3	50	18.3	7.7	15.4	26.0	52.0
Commercial 4	50	18.3	8.1	16.3	26.4	52.9

The maximum predicted concentrations occur within the site boundary, where the maximum PEC would be is less than 70% of the EAL. Offsite concentrations will be significantly lower with the maximum PEC at the assessed receptors 53% of the EAL.

The maximum PM_{10} annual average process contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.5 for emergency operation.

Table 0.5: Maximum Predicted Annual Average PM_{10} Concentration

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL
School Facade 1 GF	40	0.003	0.0%
School Facade 1 1st	40	0.003	0.0%

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
School Facade 2 GF	40	0.003	0.0%
School Facade 2 1st	40	0.003	0.0%
School Pitch	40	0.002	0.0%
Resi Fotheringay 1	40	0.003	0.0%
Resi Fotheringay 2	40	0.005	0.0%
Resi Fotheringay 3	40	0.006	0.0%
Resi Fotheringay 4	40	0.006	0.0%
Resi Fotheringay 5	40	0.005	0.0%
Resi Dunster Gardens 1	40	0.003	0.0%
Resi Dunster Gardens 2	40	0.003	0.0%
Dunster Gardens Playground	40	0.002	0.0%
Resi Dunster Gardens 3	40	0.003	0.0%
Resi Dunster Gardens 4	40	0.003	0.0%
Resi Dunster Gardens 5	40	0.003	0.0%
Commercial 1	40	0.009	0.0%
Commercial 2	40	0.010	0.0%
Commercial 3	40	0.012	0.0%
Commercial 4	40	0.013	0.0%

Due to low operating hours, the maximum predicted annual mean PM concentration is 0.01µg/m^3 at the assessed receptors and therefore less than 1% of the annual mean EALs for PM_{10} and $PM_{2.5}$.

CO

The maximum 8 hour running mean process contribution at the point of maximum concentration from any of the 5 years of meteorological data are presented in Table 5.5 for emergency operation.

Table 0.6: Maximum Predicted 8 Hour running mean CO Concentration

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
School Facade 1 GF	10,000	180.6	1.8
School Facade 1 1st	10,000	183.0	1.8

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
School Facade 2 GF	10,000	133.6	1.3
School Facade 2 1st	10,000	134.6	1.3
School Pitch	10,000	160.4	1.6
Resi Fotheringay 1	10,000	185.2	1.9
Resi Fotheringay 2	10,000	164.6	1.6
Resi Fotheringay 3	10,000	165.5	1.7
Resi Fotheringay 4	10,000	171.6	1.7
Resi Fotheringay 5	10,000	165.5	1.7
Resi Dunster Gardens 1	10,000	156.0	1.6
Resi Dunster Gardens 2	10,000	159.0	1.6
Dunster Gardens Playground	10,000	151.3	1.5
Resi Dunster Gardens 3	10,000	154.1	1.5
Resi Dunster Gardens 4	10,000	168.3	1.7
Resi Dunster Gardens 5	10,000	170.9	1.7
Commercial 1	10,000	150.9	1.5
Commercial 2	10,000	140.6	1.4
Commercial 3	10,000	135.8	1.4
Commercial 4	10,000	139.0	1.4

The maximum PC at the assessed receptors occurs at the residential receptor Fotheringay 1 and are well below the 10% of the short-term EAL and therefore insignificant.

SO_2

The maximum 99.73th percentile one hour mean process contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.6 for emergency operation.

Table 0.7: Predicted 99.73th percentile hourly mean SO_2 Concentration for Emergency Operation

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
School Facade 1 GF	350	31.0	8.9
School Facade 1 1st	350	31.2	8.9
School Facade 2 GF	350	21.1	6.0
School Facade 2 1st	350	21.6	6.2
School Pitch	350	24.5	7.0
Resi Fotheringay 1	350	30.6	8.7
Resi Fotheringay 2	350	27.8	7.9

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
Resi Fotheringay 3	350	27.4	7.8
Resi Fotheringay 4	350	29.4	8.4
Resi Fotheringay 5	350	28.6	8.2
Resi Dunster Gardens 1	350	26.9	7.7
Resi Dunster Gardens 2	350	26.9	7.7
Dunster Gardens Playground	350	27.0	7.7
Resi Dunster Gardens 3	350	26.9	7.7
Resi Dunster Gardens 4	350	27.1	7.7
Resi Dunster Gardens 5	350	28.6	8.2
Commercial 1	350	27.3	7.8
Commercial 2	350	24.2	6.9
Commercial 3	350	23.6	6.7
Commercial 4	350	24.1	6.8

The maximum PC at the assessed receptors occurs at the school facade and are below the 10% of the short-term EAL and therefore insignificant.

The maximum 99.90th percentile 15 minute mean contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.6 for emergency operation.

Table 0.8: Predicted 99.90th percentile 15 minute mean SO_2 Concentration for Emergency Operation

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
School Facade 1 GF	266	33.0	12.4
School Facade 1 1st	266	32.9	12.4
School Facade 2 GF	266	24.0	9.0
School Facade 2 1st	266	24.5	9.2
School Pitch	266	29.1	10.9
Resi Fotheringay 1	266	34.1	12.8
Resi Fotheringay 2	266	29.4	11.0
Resi Fotheringay 3	266	30.1	11.3
Resi Fotheringay 4	266	31.3	11.8
Resi Fotheringay 5	266	30.5	11.4
Resi Dunster Gardens 1	266	29.3	11.0
Resi Dunster Gardens 2	266	29.4	11.1

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
Dunster Gardens Playground	266	29.1	10.9
Resi Dunster Gardens 3	266	30.0	11.3
Resi Dunster Gardens 4	266	31.3	11.8
Resi Dunster Gardens 5	266	30.8	11.6
Commercial 1	266	28.8	10.8
Commercial 2	266	25.8	9.6
Commercial 3	266	24.5	9.1
Commercial 4	266	25.1	9.3

The maximum PC at the assessed receptors occurs at the residential receptor Fotheringay 1 and are slightly above 10% of the short-term EAL to a maximum of 13%. The results are based on modelling all of the generators operating all year round and are therefore highly conservative given that operating hours will be less than 37 to comply with the 1% probability of exceeding the hourly mean NO_2 objective. Given that background SO_2 concentrations will be less than 5 µg/m^3, the PEC will be far less than 70% of the EAL and therefore insignificant.

The maximum 99.18th percentile daily mean contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.8 for emergency operation. As the maximum operating hours in an emergency are only 36, the maximum predicted daily mean concentration is very unlikely to arise.

Table 0.9: Predicted 99.18th percentile daily mean SO_2 Concentration for Emergency Operation

Receptor	EAL µg / m^3	PC µg / m^3	PC as % of the EAL
School Facade 1 GF	125	14.8	11.9
School Facade 1 1st	125	16.7	13.3
School Facade 2 GF	125	11.3	9.1
School Facade 2 1st	125	12.3	9.9
School Pitch	125	12.0	9.6
Resi Fotheringay 1	125	13.1	10.5
Resi Fotheringay 2	125	16.4	13.1
Resi Fotheringay 3	125	16.2	12.9
Resi Fotheringay 4	125	16.3	13.1
Resi Fotheringay 5	125	15.2	12.1
Resi Dunster Gardens 1	125	12.4	9.9
Resi Dunster Gardens 2	125	12.3	9.8
Dunster Gardens Playground	125	11.9	9.5

Receptor	EAL µg/m^3	PC µg/m^3	PC as % of the EAL
Resi Dunster Gardens 3	125	11.9	9.5
Resi Dunster Gardens 4	125	13.7	11.0
Resi Dunster Gardens 5	125	15.8	12.6
Commercial 1	125	16.2	13.0
Commercial 2	125	16.9	13.5
Commercial 3	125	17.4	13.9
Commercial 4	125	17.9	14.3

The results are based on modelling all of the generators operating all year round and are therefore highly conservative given that operating hours will be less than 37 to comply with the 1% probability of exceeding the hourly mean NO_2 objective. Given that background SO_2 concentrations will be less than 5 µg/m^3, the PEC will be far less than 70% of the EAL and therefore insignificant.

5.1.2 Scenario 1

This section contains the results of the testing of single generators for one hour per month for ten months. The results are presented for CyrusOne 4 and 5 separately as the maximum concentrations will not interact even if the testing were to be performed simultaneously on each site. Given the intermittent operation and short duration of the testing the maximum predicted concentrations are unlikely to occur in reality.

Nitrogen Dioxide

Figures 5.4 and 5.5 show the predicted 100%ile hourly mean NO_2 concentration during single generator testing. The results are for the stacks that gave rise to the maximum ground level concentrations. As the 100%ile results are less than 200 µg/m^3 at the receptor locations then there will be no probability of exceeding the 1-hour mean objective during single generator testing.

The contours are the maximum results from any of the five years of meteorological data modelled and are therefore do not represent the impacts from any one single year. Table 5.10 presents the results in relation to the DAQI and AEGL.

Whilst results for the school site are quoted in the table, this testing cannot be carried out during normal school hours during term time, and therefore there may not be receptors present for these results.

Table 0.10: Predicted 100th percentile NO_2 Concentrations for Single Generator Operation (µg/m^3)

Receptor	1-hour average		
	µg/m^3	AEGL	DAQI Level
CyrusOne 4			
Grid Max 495203, 180494 (Figure 5.4)	230.5	Below AEGL-1	4
School Facade 1 GF	67.7	Below AEGL-1	2

Receptor	1-hour average		
	µg/m³	AEGL	DAQI Level
School Facade 1 1st	69.2	Below AEGL-1	2
School Facade 2 GF	61.6	Below AEGL-1	1
School Facade 2 1st	62.8	Below AEGL-1	1
School Pitch	53.8	Below AEGL-1	1
Resi Fotheringay 1	103.7	Below AEGL-1	2
Resi Fotheringay 2	74.8	Below AEGL-1	2
Resi Fotheringay 3	73.2	Below AEGL-1	2
Resi Fotheringay 4	57.5	Below AEGL-1	1
Resi Fotheringay 5	59.3	Below AEGL-1	1
Resi Dunster Gardens 1	60.1	Below AEGL-1	1
Resi Dunster Gardens 2	73.5	Below AEGL-1	2
Dunster Gardens Playground	86.7	Below AEGL-1	2
Resi Dunster Gardens 3	106.8	Below AEGL-1	2
Resi Dunster Gardens 4	74.2	Below AEGL-1	2
Resi Dunster Gardens 5	65.7	Below AEGL-1	1
Commercial 1	145.4	Below AEGL-1	3
Commercial 2	47.6	Below AEGL-1	1
Commercial 3	61.9	Below AEGL-1	1
Commercial 4	69.0	Below AEGL-1	2
CyrusOne 5			
Grid Max 495238, 180361 (Figure 5.5)	267.0	Below AEGL-1	4
School Facade 1 GF	84.4	Below AEGL-1	2
School Facade 1 1st	81.5	Below AEGL-1	2
School Facade 2 GF	65.2	Below AEGL-1	1
School Facade 2 1st	64.6	Below AEGL-1	1
School Pitch	73.2	Below AEGL-1	2
Resi Fotheringay 1	120.0	Below AEGL-1	2
Resi Fotheringay 2	70.0	Below AEGL-1	2
Resi Fotheringay 3	64.7	Below AEGL-1	1
Resi Fotheringay 4	55.3	Below AEGL-1	1
Resi Fotheringay 5	53.6	Below AEGL-1	1
Resi Dunster Gardens 1	33.2	Below AEGL-1	1

Receptor	1-hour average		
	µg/m^3	AEGL	DAQI Level
Resi Dunster Gardens 2	31.9	Below AEGL-1	1
Dunster Gardens Playground	31.9	Below AEGL-1	1
Resi Dunster Gardens 3	32.8	Below AEGL-1	1
Resi Dunster Gardens 4	32.8	Below AEGL-1	1
Resi Dunster Gardens 5	22.9	Below AEGL-1	1
Commercial 1	107.2	Below AEGL-1	2
Commercial 2	37.2	Below AEGL-1	1
Commercial 3	49.9	Below AEGL-1	1
Commercial 4	55.7	Below AEGL-1	1

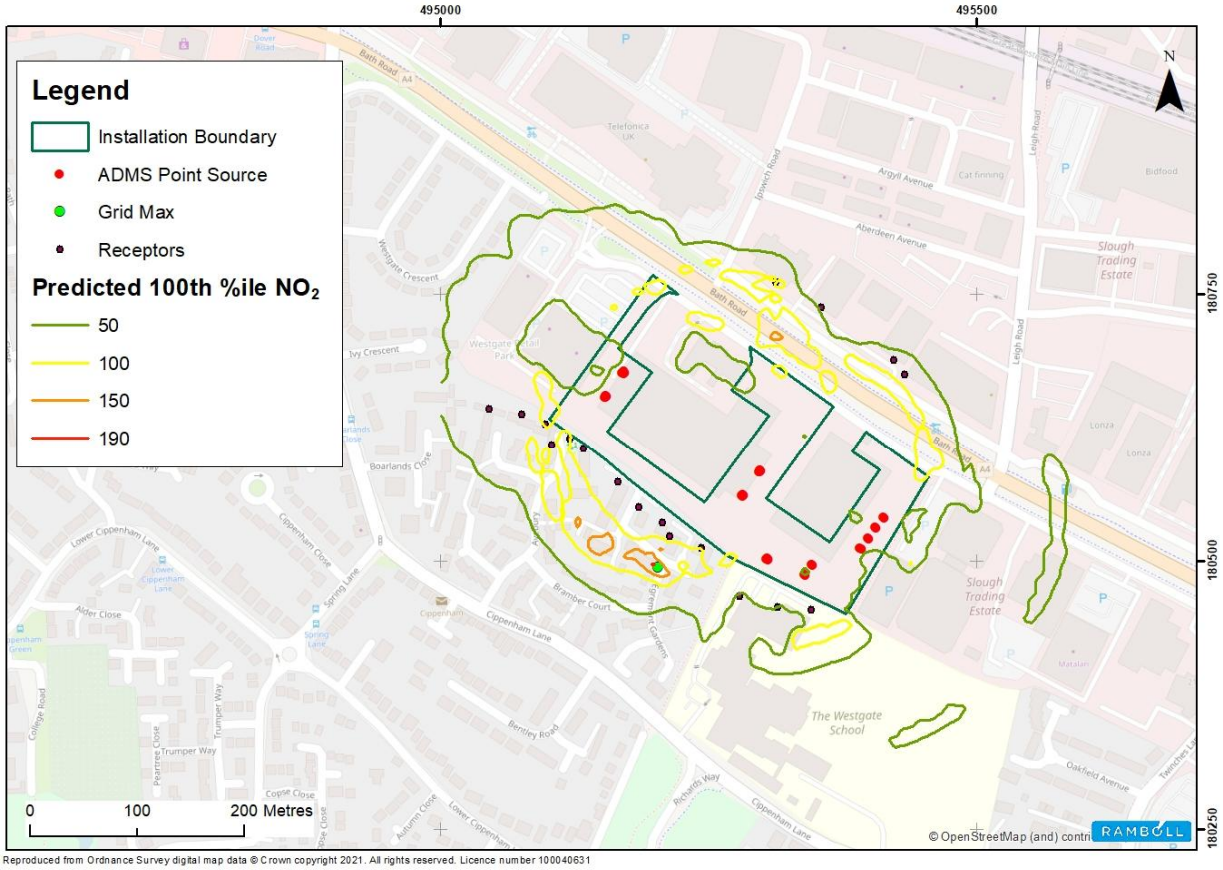


Figure 5.4: Scenario 1 CyrusOne 4 Predicted 100%ile Hourly Mean NO_2 Concentration.

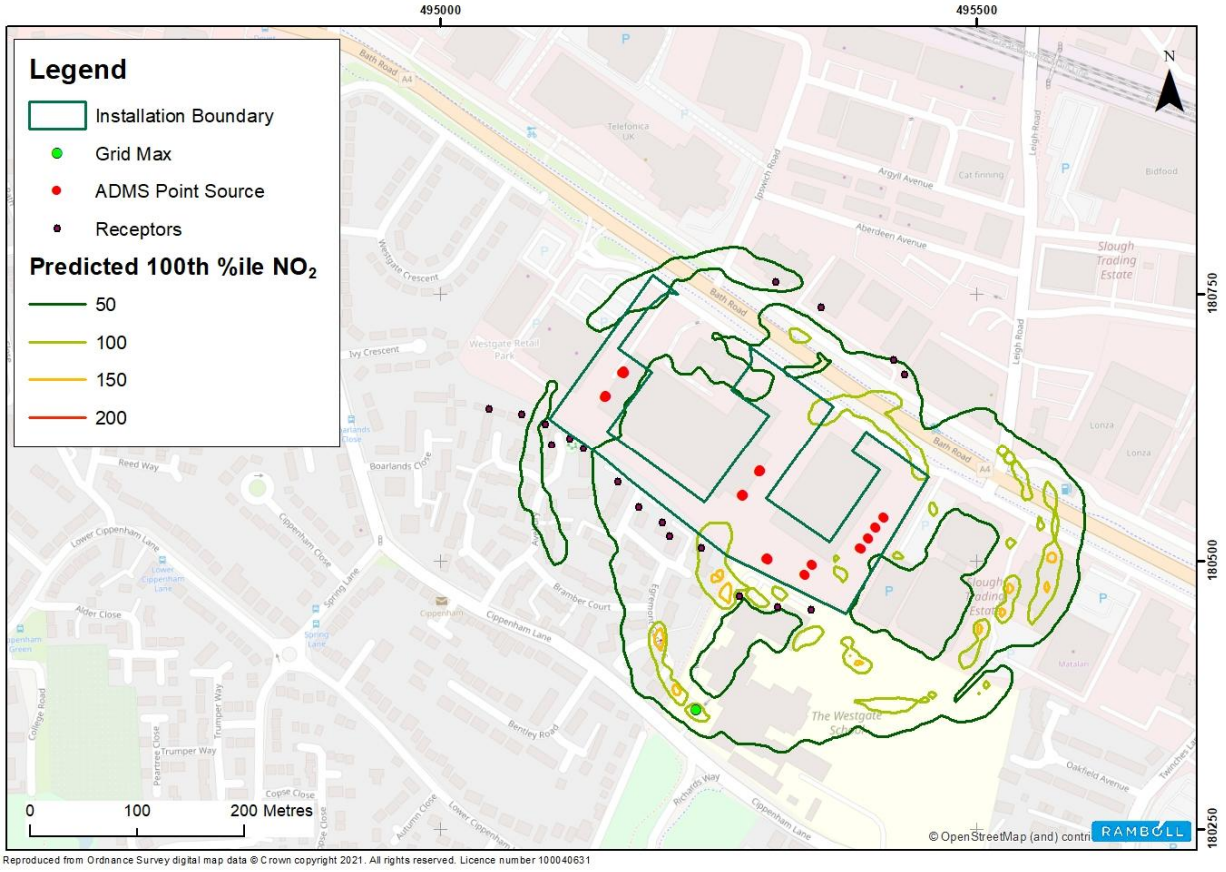


Figure 5.5: Scenario 1 CyrusOne 5 Predicted 100%ile Hourly Mean NO_2 Concentration

For CyrusOne 4 the maximum predicted concentration occurs to the south of the site at the residential properties. All of the predicted concentrations are less than AEGL-1. For CyrusOne 5 the maximum predicted concentration occurs to the south of the site at receptor Fotheringay 1 with the concentration less than AEGL-1.

Table 5.11 presents the predicted 100%ile hourly mean NO concentration during single generator testing assuming 90% conversion of NO_x to NO. All of the maximum concentrations are significantly less than the EAL of 4,400 µg/m^3.

Table 0.11: Predicted 100th percentile NO Concentrations for Emergency Operation (µg/m^3)

Receptor	NO 1-hour average (µg/m^3)	
	CyrusOne 4	CyrusOne 5
School Facade 1 GF	174.1	217.0
School Facade 1 1st	178.0	209.5
School Facade 2 GF	158.4	167.6
School Facade 2 1st	161.5	166.1
School Pitch	138.4	188.3

Receptor	NO 1-hour average (µg/m^3)	
	CyrusOne 4	CyrusOne 5
Resi Fotheringay 1	266.5	308.6
Resi Fotheringay 2	192.4	180.0
Resi Fotheringay 3	188.2	166.5
Resi Fotheringay 4	147.9	142.1
Resi Fotheringay 5	152.6	137.9
Resi Dunster Gardens 1	154.5	85.3
Resi Dunster Gardens 2	189.0	82.1
Dunster Gardens Playground	222.9	82.1
Resi Dunster Gardens 3	274.6	84.4
Resi Dunster Gardens 4	190.9	84.3
Resi Dunster Gardens 5	168.9	58.9
Commercial 1	373.8	275.7
Commercial 2	122.4	95.7
Commercial 3	159.2	128.3
Commercial 4	177.4	143.2

Table 5.11 presents the maximum annual mean NO_2 results for 32 hours testing from a single emission point on either site.

Table 0.12: Maximum Predicted Annual Mean NO_2 Concentration

Receptor	EAL µg/m^3	Annual Mean NO_2 PC µg/m^3	PC as % of the EAL	Annual Mean NO_2 PC µg/m^3	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 GF	40	0.0014	0.004	0.002	0.004
School Facade 1 1st	40	0.0015	0.004	0.002	0.004
School Facade 2 GF	40	0.0011	0.003	0.001	0.003
School Facade 2 1st	40	0.0011	0.003	0.001	0.003
School Pitch	40	0.0011	0.003	0.001	0.003
Resi Fotheringay 1	40	0.0013	0.003	0.002	0.006
Resi Fotheringay 2	40	0.0028	0.007	0.002	0.005
Resi Fotheringay 3	40	0.0039	0.010	0.002	0.005
Resi Fotheringay 4	40	0.0030	0.007	0.002	0.004

Receptor	EAL µg/m³	Annual Mean NO_2 PC µg/m³	PC as % of the EAL	Annual Mean NO_2 PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
Resi Fotheringay 5	40	0.0020	0.005	0.002	0.004
Resi Dunster Gardens 1	40	0.0014	0.004	0.001	0.002
Resi Dunster Gardens 2	40	0.0015	0.004	0.001	0.002
Dunster Gardens Playground	40	0.0013	0.003	0.001	0.002
Resi Dunster Gardens 3	40	0.0017	0.004	0.001	0.001
Resi Dunster Gardens 4	40	0.0025	0.006	0.001	0.001
Resi Dunster Gardens 5	40	0.0024	0.006	0.0004	0.001
Commercial 1	40	0.0035	0.009	0.001	0.003
Commercial 2	40	0.0034	0.008	0.001	0.004
Commercial 3	40	0.0033	0.008	0.002	0.006
Commercial 4	40	0.0037	0.009	0.003	0.006

The maximum predicted annual mean NO_2 concentrations for CyrusOne 4 and 5 are both below 0.04µg/m³ and well below the 1% and therefore insignificant.

Probability of exceeding the hourly mean NO_2 objective

The probability of exceeding the hourly mean NO_2 objective for the total number of testing hours of the facility (256h) is 0% for any receptor location in the vicinity of the site.

PM_{10} and $PM_{2.5}$

The maximum daily 90.41th percentile process contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.12 for single generator testing. As the maximum testing hours for an individual generator are only one, the maximum predicted daily mean concentration is very unlikely to arise.

Table 0.13: Maximum Predicted Daily 90.41th percentile PM_{10} Concentration

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 GF	50	0.01	0.02	0.02	0.03
School Facade 1 1st	50	0.01	0.02	0.02	0.04
School Facade 2 GF	50	0.01	0.02	0.02	0.03

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 2 1st	50	0.01	0.02	0.02	0.03
School Pitch	50	0.01	0.03	0.01	0.02
Resi Fotheringay 1	50	0.02	0.03	0.05	0.09
Resi Fotheringay 2	50	0.07	0.14	0.06	0.11
Resi Fotheringay 3	50	0.09	0.17	0.06	0.13
Resi Fotheringay 4	50	0.08	0.16	0.04	0.08
Resi Fotheringay 5	50	0.04	0.09	0.03	0.07
Resi Dunster Gardens 1	50	0.01	0.02	0.01	0.02
Resi Dunster Gardens 2	50	0.02	0.03	0.01	0.02
Dunster Gardens Playground	50	0.01	0.02	0.01	0.02
Resi Dunster Gardens 3	50	0.01	0.02	0.01	0.01
Resi Dunster Gardens 4	50	0.02	0.04	0.01	0.01
Resi Dunster Gardens 5	50	0.03	0.05	0.01	0.01
Commercial 1	50	0.08	0.16	0.02	0.04
Commercial 2	50	0.08	0.17	0.03	0.06
Commercial 3	50	0.08	0.16	0.06	0.12
Commercial 4	50	0.09	0.18	0.07	0.13

The maximum PCs are well below the 10% of the short term EAL and therefore insignificant.

Due to low operating hours, the maximum predicted annual mean PM concentration is 0.00µg/m³ and therefore less than 1% of the annual mean EALs for PM_{10} and $PM_{2.5}$.

CO

The maximum 8 hour running mean process contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.13 for single generator testing.

Table 0.14: Maximum Predicted 8 Hour running mean CO Concentration

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 GF	10,000	0.07	0.001	0.09	0.001

Receptor	EAL µg/m^3	PC µg/m^3	PC as % of the EAL	PC µg/m^3	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 1st	10,000	0.08	0.001	0.09	0.001
School Facade 2 GF	10,000	0.06	0.001	0.06	0.001
School Facade 2 1st	10,000	0.06	0.001	0.06	0.001
School Pitch	10,000	0.06	0.001	0.07	0.001
Resi Fotheringay 1	10,000	0.07	0.001	0.11	0.001
Resi Fotheringay 2	10,000	0.14	0.001	0.09	0.001
Resi Fotheringay 3	10,000	0.20	0.002	0.10	0.001
Resi Fotheringay 4	10,000	0.15	0.001	0.09	0.001
Resi Fotheringay 5	10,000	0.10	0.001	0.08	0.001
Resi Dunster Gardens 1	10,000	0.07	0.001	0.03	0.000
Resi Dunster Gardens 2	10,000	0.08	0.001	0.03	0.000
Dunster Gardens Playground	10,000	0.07	0.001	0.03	0.000
Resi Dunster Gardens 3	10,000	0.09	0.001	0.03	0.000
Resi Dunster Gardens 4	10,000	0.13	0.001	0.03	0.000
Resi Dunster Gardens 5	10,000	0.12	0.001	0.02	0.000
Commercial 1	10,000	0.18	0.002	0.06	0.001
Commercial 2	10,000	0.17	0.002	0.07	0.001
Commercial 3	10,000	0.17	0.002	0.12	0.001
Commercial 4	10,000	0.19	0.002	0.13	0.001

The maximum PCs are well below 10% of the short-term EAL and therefore insignificant.

SO_2

The maximum 99.73th percentile one hour mean process contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.14 for single generator testing.

Table 0.15: Predicted 99.73th percentile hourly mean SO_2 Concentration for Emergency Operation

Receptor	EAL µg/m^3	PC µg/m^3	PC as % of the EAL	PC µg/m^3	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 GF	350	2.7	0.8	2.5	0.7

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 1st	350	2.8	0.8	2.5	0.7
School Facade 2 GF	350	1.6	0.5	1.7	0.5
School Facade 2 1st	350	1.6	0.5	1.7	0.5
School Pitch	350	2.1	0.6	2.4	0.7
Resi Fotheringay 1	350	1.8	0.5	3.2	0.9
Resi Fotheringay 2	350	3.5	1.0	2.5	0.7
Resi Fotheringay 3	350	3.4	1.0	2.7	0.8
Resi Fotheringay 4	350	3.1	0.9	2.4	0.7
Resi Fotheringay 5	350	2.7	0.8	2.6	0.7
Resi Dunster Gardens 1	350	2.1	0.6	1.0	0.3
Resi Dunster Gardens 2	350	1.9	0.5	0.9	0.3
Dunster Gardens Playground	350	1.8	0.5	0.9	0.3
Resi Dunster Gardens 3	350	2.8	0.8	0.8	0.2
Resi Dunster Gardens 4	350	3.6	1.0	0.7	0.2
Resi Dunster Gardens 5	350	3.6	1.0	0.7	0.2
Commercial 1	350	2.5	0.7	1.3	0.4
Commercial 2	350	2.5	0.7	1.6	0.4
Commercial 3	350	2.5	0.7	2.2	0.6
Commercial 4	350	2.8	0.8	2.4	0.7

Both of the maximum PCs well below 10% of the EAL and are therefore insignificant.

The maximum 99.90th percentile 15-minute mean contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.15 for single generator testing.

Table 0.16: Predicted 99.90th percentile 15 minute mean SO_2 Concentration for Emergency Operation

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 GF	266	3.6	1.4	4.2	1.6
School Facade 1 1st	266	3.8	1.4	4.0	1.5

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 2 GF	266	3.2	1.2	3.4	1.3
School Facade 2 1st	266	3.2	1.2	3.4	1.3
School Pitch	266	3.1	1.2	4.3	1.6
Resi Fotheringay 1	266	4.4	1.6	6.1	2.3
Resi Fotheringay 2	266	4.4	1.6	3.6	1.3
Resi Fotheringay 3	266	4.1	1.6	3.4	1.3
Resi Fotheringay 4	266	3.6	1.4	3.4	1.3
Resi Fotheringay 5	266	3.4	1.3	3.3	1.3
Resi Dunster Gardens 1	266	3.1	1.2	1.6	0.6
Resi Dunster Gardens 2	266	3.4	1.3	1.4	0.5
Dunster Gardens Playground	266	3.0	1.1	1.5	0.6
Resi Dunster Gardens 3	266	4.1	1.6	1.4	0.5
Resi Dunster Gardens 4	266	4.5	1.7	1.2	0.5
Resi Dunster Gardens 5	266	4.0	1.5	1.1	0.4
Commercial 1	266	3.0	1.1	2.0	0.8
Commercial 2	266	2.9	1.1	2.2	0.8
Commercial 3	266	3.0	1.1	2.8	1.1
Commercial 4	266	3.7	1.4	2.9	1.1

Both of the maximum PCs well below 10% of the EAL and are therefore insignificant.

The maximum 99.18th percentile daily mean contribution at the assessed receptors from any of the 5 years of meteorological data are presented in Table 5.16 for single generator testing. As the maximum operating hours are only 32, the maximum predicted daily mean concentration is very unlikely to arise.

Table 0.17: Predicted 99.18th percentile daily mean SO_2 Concentration for Emergency Operation

Receptor	EAL µg/m³	PC µg/m³	PC as % of the EAL	PC µg/m³	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 1 GF	125	0.3	0.2	0.3	0.3
School Facade 1 1st	125	0.3	0.2	0.3	0.3
School Facade 2 GF	125	0.3	0.2	0.3	0.2

Receptor	EAL µg/m^3	PC µg/m^3	PC as % of the EAL	PC µg/m^3	PC as % of the EAL
		CyrusOne 4		CyrusOne 5	
School Facade 2 1st	125	0.3	0.2	0.3	0.2
School Pitch	125	0.2	0.2	0.3	0.3
Resi Fotheringay 1	125	0.3	0.2	0.4	0.4
Resi Fotheringay 2	125	0.3	0.3	0.3	0.2
Resi Fotheringay 3	125	0.3	0.3	0.3	0.2
Resi Fotheringay 4	125	0.3	0.2	0.3	0.2
Resi Fotheringay 5	125	0.3	0.2	0.2	0.2
Resi Dunster Gardens 1	125	0.2	0.2	0.1	0.1
Resi Dunster Gardens 2	125	0.3	0.2	0.1	0.1
Dunster Gardens Playground	125	0.3	0.2	0.1	0.1
Resi Dunster Gardens 3	125	0.3	0.3	0.1	0.1
Resi Dunster Gardens 4	125	0.4	0.3	0.1	0.1
Resi Dunster Gardens 5	125	0.3	0.3	0.1	0.1
Commercial 1	125	0.3	0.2	0.2	0.2
Commercial 2	125	0.2	0.2	0.2	0.1
Commercial 3	125	0.2	0.2	0.2	0.2
Commercial 4	125	0.3	0.2	0.2	0.2

Both of the maximum PCs well below 10% of the EAL and are therefore insignificant.

5.1.3 Scenario 2

The emergency scenario determined that the facility could operate with all generators (both CyrusOne 4 and 5) running simultaneously for 37 hours before reaching the 1% probability of exceeding the hourly mean NO_2 objective, and no exceedances of other EALs was identified. As such, for Scenario 2 where CyrusOne 4 and CyrusOne 5 would operate independently for 1.5 hours per year each, no exceedances of the assessed pollutants EALs would be expected as there would be half the number of generators operating for a significant shorter period of time. Similarly, the combined results of Scenario 1 with Scenario 2 would not result in an exceedance of the assessed EALs. The Scenarios 2 results for all pollutants are therefore not presented, except for the NO and NO_2 100th percentile.

The results are presented for CyrusOne 4 and 5 separately. The Scenario 2 model was set up assuming that the testing would be carried out during the core office hours (09h00 to 17h00), outside school term time which was taken to be the month of August. The model was run for all office hours during the month of August, i.e. 8 hours per day, 5 days per week or a maximum of 23 days in the month. The

results are therefore conservative as the test would only run for 1.5 hours during the modelling period, and therefore the maximum predicted concentrations are unlikely to occur in reality.

Nitrogen Dioxide

Table 5.18 presents the 100th percentile NO_2 results in relation to the DAQI and AEGL.

Table 0.18: Predicted 100th percentile NO_2 Concentrations ($\mu g / m^3$)

Receptor	1-hour average		
	$\mu g / m^3$	AEGL	DAQI Level
CyrusOne 4			
School Facade 1 GF	221.1	Below AEGL-1	4
School Facade 1 1st	227.2	Below AEGL-1	4
School Facade 2 GF	209.6	Below AEGL-1	4
School Facade 2 1st	212.9	Below AEGL-1	4
School Pitch	236.5	Below AEGL-1	4
Resi Fotheringay 1	132.0	Below AEGL-1	2
Resi Fotheringay 2	182.4	Below AEGL-1	3
Resi Fotheringay 3	263.7	Below AEGL-1	4
Resi Fotheringay 4	266.5	Below AEGL-1	4
Resi Fotheringay 5	216.4	Below AEGL-1	4
Resi Dunster Gardens 1	187.8	Below AEGL-1	3
Resi Dunster Gardens 2	187.8	Below AEGL-1	3
Dunster Gardens Playground	156.4	Below AEGL-1	3
Resi Dunster Gardens 3	273.5	Below AEGL-1	5
Resi Dunster Gardens 4	217.6	Below AEGL-1	4
Resi Dunster Gardens 5	277.7	Below AEGL-1	5
Commercial 1	300.2	Below AEGL-1	5
Commercial 2	220.8	Below AEGL-1	4
Commercial 3	264.1	Below AEGL-1	4
Commercial 4	311.1	Below AEGL-1	5
CyrusOne 5			
School Facade 1 GF	416.1	Below AEGL-1	7
School Facade 1 1st	405.7	Below AEGL-1	7
School Facade 2 GF	298.9	Below AEGL-1	5
School Facade 2 1st	309.0	Below AEGL-1	5
School Pitch	153.3	Below AEGL-1	3

Receptor	1-hour average		
	µg/m³	AEGL	DAQI Level
Resi Fotheringay 1	390.5	Below AEGL-1	6
Resi Fotheringay 2	315.4	Below AEGL-1	5
Resi Fotheringay 3	323.5	Below AEGL-1	5
Resi Fotheringay 4	324.4	Below AEGL-1	5
Resi Fotheringay 5	318.1	Below AEGL-1	5
Resi Dunster Gardens 1	271.0	Below AEGL-1	5
Resi Dunster Gardens 2	264.6	Below AEGL-1	4
Dunster Gardens Playground	267.5	Below AEGL-1	4
Resi Dunster Gardens 3	263.2	Below AEGL-1	4
Resi Dunster Gardens 4	276.6	Below AEGL-1	5
Resi Dunster Gardens 5	215.1	Below AEGL-1	4
Commercial 1	319.9	Below AEGL-1	5
Commercial 2	305.8	Below AEGL-1	5
Commercial 3	376.1	Below AEGL-1	6
Commercial 4	392.4	Below AEGL-1	6

For CyrusOne 4 the maximum predicted concentration occurs to the north of the site. All of the predicted concentrations are less than AEGL-1. For CyrusOne 5 the maximum predicted concentration occurs in the school site (where there are unlikely to be receptors at the time of operation) with the concentration below AEGL-1.

The maximum annual NO_2 concentration is 0.00µg/m³ for CyrusOne 4 and 5 and therefore insignificant.

Table 5.19 presents the predicted 100%ile hourly mean NO concentration during testing of 16 generators assuming 90% conversion of NO_x to NO. Due to uncertainty in how these results should be interpreted, we have simply provided the data, as requested.

Table 0.19: Predicted 100th percentile NO Concentrations for Emergency Operation (µg/m³)

Receptor	NO 1-hour average (µg/m³)	
	CyrusOne 4	CyrusOne 5
School Facade 1 GF	568.6	1069.9
School Facade 1 1st	584.3	1043.3
School Facade 2 GF	539.0	768.5
School Facade 2 1st	547.4	794.5
School Pitch	608.2	394.1

Receptor	NO 1-hour average (µg/m^3)	
	CyrusOne 4	CyrusOne 5
Resi Fotheringay 1	339.3	1004.0
Resi Fotheringay 2	469.2	811.0
Resi Fotheringay 3	678.0	831.8
Resi Fotheringay 4	685.2	834.1
Resi Fotheringay 5	556.3	818.0
Resi Dunster Gardens 1	482.9	696.8
Resi Dunster Gardens 2	482.9	680.5
Dunster Gardens Playground	402.1	688.0
Resi Dunster Gardens 3	703.3	676.8
Resi Dunster Gardens 4	559.6	711.3
Resi Dunster Gardens 5	714.1	553.0
Commercial 1	771.9	822.6
Commercial 2	567.8	786.4
Commercial 3	679.2	967.1
Commercial 4	800.0	1009.0

Probability of exceeding the hourly mean NO_2 objective

As the total operating hours for each site is only 1.5 hours, then there is a zero percent probability of exceeding the hourly mean NO_2 objective.

5.2 Ecological Receptors

5.2.1 Emergency Operation

5.2.1.1 Baseline

Site Relevant Critical Loads and Baseline Deposition Rates are presented in Table 5.20.

Table 0.20: Site Relevant Critical Loads and Baseline Deposition Rates

Type	Site	Habitat	Minimum critical load for N (kgN/ha/yr)	Nitrogen (kgN/ha/yr)	Nitrogen acid (keqN/ha/yr)	Sulphur acid (keqS/ha/yr)	Acidity Critical Load (keq) MinCLMaxN
SAC, SSSI, NNR	Burnham Beeches	Woodland	10	26.7	1.9	0.2	2.1

Type	Site	Habitat	Minimum critical load for N (kgN/ha/yr)	Nitrogen (kgN/ha/yr)	Nitrogen acid (keqN/ha/yr)	Sulphur acid (keqS/ha/yr)	Acidity Critical Load (keq) MinCLMaxN
SPA, SAC, SSSI, NNR	Chiltern Beechwoods	Woodland	10	29.1	2.1	0.2	1.6
SAC, SSSI	Windsor Forest 1	Woodland	10	30.7	2.2	0.2	2.7
SAC, SSSI	Windsor Forest 2	Woodland	10	30.7	2.2	0.2	2.7
SPA, Ramsar, SSSI	South West London 1	Standing open water and canals, grassland	20	17.6	1.3	0.2	1.1
SPA, Ramsar, SSSI	South West London 2	Standing open water and canals, grassland	20	17.6	1.3	0.2	1.1
LNR	Haymill Valley LNR	Grassland	10	15.12	1.08	0.15	2.658
LNR	Dorney Common and Cress Brook	Grassland	10	15.68	1.12	0.13	4.856
LNR	Railway Triangle 1	Woodland	10	28.14	2.01	0.21	1.711
LNR	Railway Triangle 2	Woodland	10	28.14	2.01	0.21	1.711
LNR	Jubilee River and Dorney Wetlands 1	Grassland	10	15.68	1.12	0.13	4.856
LNR	Jubilee River and Dorney Wetlands 2	Grassland	10	15.68	1.12	0.13	4.856

5.2.1.2 Critical Levels

Predicted annual mean NO_x concentrations within the sensitive ecological receptors are shown in Table 5.21. The predicted concentrations assume that all of the generators operate for a period of 37 hours in year.

Table 0.21: Predicted Annual Mean NO_x Concentrations ($\mu g/m^3$)

Site	Critical Level ($\mu g/m^3$)	PC ($\mu g/m^3$)	% PC of Critical Level	Assessment Criteria ($\mu g/m^3$)	2021 NO_x Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	% PEC Critical Level
Burnham Beeches	30	0.016	0.05%	1%	16.4	16.4	54.6%
Chiltern Beechwoods	30	0.003	0.01%	1%	15.1	15.1	50.2%

Site	Critical Level (µg/m³)	PC (µg/m³)	% PC of Critical Level	Assessment Criteria (µg/m³)	2021 NO_x Background (µg/m³)	PEC (µg/m³)	% PEC Critical Level
Windsor Forest 1	30	0.010	0.03%	1%	16.5	16.5	55.0%
Windsor Forest 2	30	0.015	0.05%	1%	14.7	14.7	49.0%
South West London 1	30	0.009	0.03%	1%	19.9	19.9	66.4%
South West London 2	30	0.009	0.03%	1%	22.4	22.4	74.5%
Haymill Valley LNR	30	0.035	0.12%	100%	27.2	27.3	90.9%
Dorney Common and Cress Brook	30	0.045	0.15%	100%	27.6	27.7	92.3%
Railway Triangle 1	30	0.071	0.24%	100%	31.1	31.2	103.9%
Railway Triangle 2	30	0.059	0.20%	100%	31.1	31.2	103.8%
Jubilee River and Dorney Wetlands 1	30	0.039	0.13%	100%	23.1	23.1	77.1%

The annual mean process contributions at the ecological sites are all insignificant.

The daily mean process contributions at the ecological sites in emergency operation are shown in Table 5.20 assuming that the generators operate all year round. As the emergency operation will last for less than 37 hours (or 0.4% of a year), the predicted daily mean concentrations are unlikely to occur in reality.

Table 0.22: Predicted Daily Mean NO_x Concentrations (µg/m³)

Receptor	NO_x Process Contribution (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC% of EAL	
				EAL 75µg/m³	EAL 200µg/m³
Burnham Beeches	35.8	16.4	52.1	69.5%	26.1%
Chiltern Beechwoods	17.6	15.1	32.7	43.6%	16.3%
Windsor Forest 1	32.7	16.5	49.2	65.5%	24.6%
Windsor Forest 2	45.5	14.7	60.2	80.2%	30.1%

Receptor	NO_x Process Contribution ($\mu g/m^3$)	Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC% of EAL	
				EAL 75$\mu g/m^3$	EAL 200$\mu g/m^3$
South West London 1	32.2	19.9	52.1	69.5%	26.1%
South West London 2	24.0	22.4	46.4	61.8%	23.2%
Haymill Valley LNR	149.7	27.2	177.0	236.0%	88.5%
Dorney Common and Cress Brook	111.9	27.6	139.5	186.0%	69.8%
Railway Triangle 1	104.1	31.1	135.2	180.2%	67.6%
Railway Triangle 2	147.8	31.1	178.9	238.6%	89.5%
Jubilee River and Dorney Wetlands 1	94.7	23.1	117.8	157.1%	58.9%
Jubilee River and Dorney Wetlands 2	125.4	27.6	153.0	204.0%	76.5%

5.2.1.3 Critical Loads

The maximum predicted nitrogen and acid deposition within the habitats are shown in Tables 5.23 and 5.24 based on 37 hours operation per year.

Table 0.23: Maximum Nitrogen Deposition

Site	Critical Load (kgN/ha/yr)	PC (kgN/ha/yr)	% PC of Critical Load
Burnham Beeches	10	0.003	0.03%
Chiltern Beechwoods	10	0.001	0.01%
Windsor Forest 1	10	0.002	0.02%
Windsor Forest 2	10	0.003	0.03%
South West London 1	20	0.001	0.00%

Site	Critical Load (kgN/ha/yr)	PC (kgN/ha/yr)	% PC of Critical Load
South West London 2	20	0.001	0.00%
Haymill Valley LNR	10	0.003	0.03%
Dorney Common and Cress Brook	10	0.004	0.04%
Railway Triangle 1	10	0.014	0.14%
Railway Triangle 2	10	0.012	0.12%
Jubilee River and Dorney Wetlands 1	10	0.004	0.04%
Jubilee River and Dorney Wetlands 2	10	0.004	0.04%

Table 0.24: Maximum nitrogen acid deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	1.9	0.00023	0.01%
Chiltern Beechwoods	2.1	0.00004	0.00%
Windsor Forest 1	2.2	0.00014	0.01%
Windsor Forest 2	2.2	0.00022	0.01%
South West London 1	1.3	0.00007	0.01%
South West London 2	1.3	0.00006	0.00%
Haymill Valley LNR	1.08	0.00025	0.02%
Dorney Common and Cress Brook	1.12	0.00032	0.03%
Railway Triangle 1	2.01	0.00102	0.05%
Railway Triangle 2	2.01	0.00085	0.04%

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Jubilee River and Dorney Wetlands 1	1.12	0.00028	0.03%
Jubilee River and Dorney Wetlands 2	1.12	0.00032	0.03%

The maximum predicted nitrogen and nitrogen acid depositions at each of the receptors is well below 1% of the relevant critical load and therefore insignificant.

The maximum predicted SO_2 acid deposition within the habitats is shown in 5.25. The combined total acid deposition is presented in Table 5.26.

Table 0.25: Maximum SO_2 acid deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	0.2	0.00008	0.04%
Chiltern Beechwoods	0.2	0.00001	0.01%
Windsor Forest 1	0.2	0.00005	0.03%
Windsor Forest 2	0.2	0.00008	0.04%
South West London 1	0.2	0.00003	0.01%
South West London 2	0.2	0.00002	0.01%
Haymill Valley LNR	0.15	0.00009	0.06%
Dorney Common and Cress Brook	0.13	0.00012	0.09%
Railway Triangle 1	0.21	0.00038	0.18%
Railway Triangle 2	0.21	0.00031	0.15%
Jubilee River and Dorney Wetlands 1	0.13	0.00011	0.08%
Jubilee River and Dorney Wetlands 2	0.13	0.00012	0.09%

0.26: Total Acid Deposition (Nitrogen and SO_2 combined)

Site	Acidity Critical Load (keq) MinCLMaxN	PC (kg/ha/yr)	% PC of Critical Load
Burnham Beeches	2.1	0.00031	0.015%
Chiltern Beechwoods	1.6	0.00005	0.003%
Windsor Forest 1	2.7	0.00019	0.007%
Windsor Forest 2	2.7	0.00030	0.011%
South West London 1	1.1	0.00009	0.008%
South West London 2	1.1	0.00008	0.008%
Haymill Valley LNR	2.658	0.00034	0.013%
Dorney Common and Cress Brook	4.856	0.00044	0.009%
Railway Triangle 1	1.711	0.00140	0.082%
Railway Triangle 2	1.711	0.00116	0.068%
Jubilee River and Dorney Wetlands 1	4.856	0.00039	0.008%
Jubilee River and Dorney Wetlands 2	4.856	0.00044	0.009%

The maximum predicted acid depositions at each of the receptors is well below 1% of the relevant critical load and therefore insignificant.

5.2.2 Scenario 1

For annual mean impacts, as all of the generators will be tested for a maximum of 32 hours per year. For the short term impacts, the results are presented for CyrusOne 4 and 5 separately from the generator stack location that gave the highest predicted concentration at the receptor.

5.2.2.1 CyrusOne 4 Critical Level

Site Relevant Critical Loads and Baseline Deposition Rates are presented in Table 5.20. Predicted annual mean NO_x concentrations within the sensitive ecological receptors from CyrusOne 4 Scenarios 1 are shown in Table 5.27.

Table 0.27: Predicted Annual Mean NO_x Concentrations ($\mu g/m^3$)

Site	Critical Level ($\mu g/m^3$)	PC ($\mu g/m^3$)	% PC of Critical Level	Assessment Criteria ($\mu g/m^3$)	2021 NOx Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	% PEC Critical Level
Burnham Beeches	30	0.00002	0.00007 %	1%	16.4	16.4	54.5%
Chiltern Beechwoods	30	0.00000	0.00001 %	1%	15.1	15.1	50.2%
Windsor Forest 1	30	0.00001	0.00004 %	1%	16.5	16.5	54.9%
Windsor Forest 2	30	0.00001	0.00004 %	1%	14.7	14.7	48.9%
South West London 1	30	0.00002	0.00005 %	1%	19.9	19.9	66.3%
South West London 2	30	0.00001	0.00004 %	1%	22.4	22.4	74.5%
Haymill Valley LNR	30	0.00014	0.00045 %	100%	0.0	0.0	0.0%
Dorney Common and Cress Brook	30	0.00005	0.00018 %	100%	27.6	27.6	92.1%
Railway Triangle 1	30	0.00011	0.00038 %	100%	31.1	31.1	103.6%
Railway Triangle 2	30	0.00010	0.00034 %	100%	31.1	31.1	103.6%
Jubilee River and Dorney Wetlands 1	30	0.00007	0.00025 %	100%	23.1	23.1	77.0%

The annual mean process contributions at the ecological sites are all insignificant.

The daily mean process contributions at the ecological sites in Scenario 1 are shown in Table 5.28.

Table 0.28: Predicted Daily Mean NO_x Concentrations ($\mu g/m^3$)

Receptor	NO_x Process Contribution ($\mu g/m^3$)	Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC% of EAL	
				EAL 75$\mu g/m^3$	EAL 200$\mu g/m^3$
Burnham Beeches	0.71	16.4	17.1	22.8%	8.5%
Chiltern Beechwoods	0.11	15.1	15.2	20.2%	7.6%
Windsor Forest 1	0.32	16.5	16.8	22.4%	8.4%

Receptor	NO_x Process Contribution ($\mu g/m^3$)	Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC% of EAL	
				EAL 75$\mu g/m^3$	EAL 200$\mu g/m^3$
Windsor Forest 2	0.38	14.7	15.0	20.1%	7.5%
South West London 1	0.29	19.9	20.2	26.9%	10.1%
South West London 2	0.25	22.4	22.6	30.1%	11.3%
Haymill Valley LNR	1.53	27.2	28.8	38.3%	14.4%
Dorney Common and Cress Brook	1.19	27.6	28.8	38.4%	14.4%
Railway Triangle 1	1.10	31.1	32.2	42.9%	16.1%
Railway Triangle 2	0.89	31.1	32.0	42.7%	16.0%
Jubilee River and Dorney Wetlands 1	1.35	23.1	24.4	32.6%	12.2%
Jubilee River and Dorney Wetlands 2	1.82	27.6	29.5	39.3%	14.7%

All of the predicted PCs are insignificant in relation to the daily mean critical level.

5.2.2.2 CyrusOne 4 Critical Load

The maximum predicted nitrogen and acid deposition within the habitats are shown in 5.29 and 5.30.

Table 0.29: Maximum Nitrogen Deposition

Site	Critical Load (kg/ha/yr)	PC (kg/ha/yr)	% PC of Critical Load
Burnham Beeches	10	0.000004	0.00004%
Chiltern Beechwoods	10	0.000001	0.00001%
Windsor Forest 1	10	0.000002	0.00002%

Site	Critical Load (kg/ha/yr)	PC (kg/ha/yr)	% PC of Critical Load
Windsor Forest 2	10	0.000002	0.00002%
South West London 1	20	0.000002	0.00001%
South West London 2	20	0.000001	0.00001%
Haymill Valley LNR	10	0.000014	0.00014%
Dorney Common and Cress Brook	10	0.000005	0.00005%
Railway Triangle 1	10	0.000023	0.00023%
Railway Triangle 2	10	0.000021	0.00021%
Jubilee River and Dorney Wetlands 1	10	0.000007	0.00007%
Jubilee River and Dorney Wetlands 2	10	0.000008	0.00008%

Table 0.30: Maximum nitrogen acid deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	1.9	0.00000030	0.00002%
Chiltern Beechwoods	2.1	0.00000005	0.00000%
Windsor Forest 1	2.2	0.00000017	0.00001%
Windsor Forest 2	2.2	0.00000017	0.00001%
South West London 1	1.3	0.00000011	0.00001%
South West London 2	1.3	0.00000010	0.00001%
Haymill Valley LNR	1.08	0.00000098	0.00009%
Dorney Common and Cress Brook	1.12	0.00000038	0.00003%
Railway Triangle 1	2.01	0.00000164	0.00008%

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Railway Triangle 2	2.01	0.00000148	0.00007%
Jubilee River and Dorney Wetlands 1	1.12	0.00000053	0.00005%
Jubilee River and Dorney Wetlands 2	1.12	0.00000060	0.00005%

The maximum predicted nitrogen and nitrogen acid depositions at each of the receptors is well below 1% of the relevant critical load and therefore insignificant.

The maximum predicted SO_2 acid deposition within the habitats is shown in Table 5.31. The combined total acid deposition is presented in Table 5.32.

Table 0.31: Maximum SO_2 acid deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	0.2	0.0000001	0.00005%
Chiltern Beechwoods	0.2	0.0000000	0.00001%
Windsor Forest 1	0.2	0.0000001	0.00003%
Windsor Forest 2	0.2	0.0000001	0.00003%
South West London 1	0.2	0.0000000	0.00002%
South West London 2	0.2	0.0000000	0.00002%
Haymill Valley LNR	0.15	0.0000004	0.00024%
Dorney Common and Cress Brook	0.13	0.0000001	0.00011%
Railway Triangle 1	0.21	0.0000006	0.00029%
Railway Triangle 2	0.21	0.0000005	0.00026%
Jubilee River and Dorney Wetlands 1	0.13	0.0000002	0.00015%

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Jubilee River and Dorney Wetlands 2	0.13	0.0000002	0.00017%

Table 0.32: Total Acid Deposition (Nitrogen and SO_2 combined)

Site	Acidity Critical Load (keq) MinCLMaxN	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	2.1	0.0000004	0.00002%
Chiltern Beechwoods	1.6	0.0000001	0.00000%
Windsor Forest 1	2.7	0.0000002	0.00001%
Windsor Forest 2	2.7	0.0000002	0.00001%
South West London 1	1.1	0.0000001	0.00001%
South West London 2	1.1	0.0000001	0.00001%
Haymill Valley LNR	2.658	0.0000013	0.00005%
Dorney Common and Cress Brook	4.856	0.0000005	0.00001%
Railway Triangle 1	1.711	0.0000023	0.00013%
Railway Triangle 2	1.711	0.0000020	0.00012%
Jubilee River and Dorney Wetlands 1	4.856	0.0000007	0.00002%
Jubilee River and Dorney Wetlands 2	4.856	0.0000008	0.00002%

The maximum predicted SO_2 and total acid depositions at each of the receptors is well below 1% of the relevant critical load. Overall, acid deposition are not significant, and no consideration of the PECs is necessary.

5.2.2.3 CyrusOne 5 Critical Level

Site Relevant Critical Loads and Baseline Deposition Rates are presented in Table 5.20. Predicted annual mean NO_x concentrations within the sensitive ecological receptors from CyrusOne 5 Scenario 1 are shown in Table 5.33.

Table 0.33: Predicted Annual Mean NO_x Concentrations ($\mu g/m^3$)

Site	Critical Level ($\mu g/m^3$)	PC ($\mu g/m^3$)	% PC of Critical Level	Assessment Criteria ($\mu g/m^3$)	2021 NOx Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	% PEC Critical Level
Burnham Beeches	30	0.00002	0.00006 %	1%	16.4	16.4	54.5%
Chiltern Beechwoods	30	0.00000	0.00001 %	1%	15.1	15.1	50.2%
Windsor Forest 1	30	0.00001	0.00004 %	1%	16.5	16.5	54.9%
Windsor Forest 2	30	0.00001	0.00004 %	1%	14.7	14.7	48.9%
South West London 1	30	0.00001	0.00005 %	1%	19.9	19.9	66.3%
South West London 2	30	0.00001	0.00005 %	1%	22.4	22.4	74.5%
Haymill Valley LNR	30	0.00011	0.00036 %	100%	0.0	0.0	0.0%
Dorney Common and Cress Brook	30	0.00005	0.00018 %	100%	27.6	27.6	92.1%
Railway Triangle 1	30	0.00013	0.00042 %	100%	31.1	31.1	103.6%
Railway Triangle 2	30	0.00011	0.00037 %	100%	31.1	31.1	103.6%
Jubilee River and Dorney Wetlands 1	30	0.00008	0.00026 %	100%	23.1	23.1	77.0%

The annual mean process contributions at the ecological sites are all insignificant

The daily mean process contributions at the ecological sites in emergency operation are shown in Table 5.34.

Table 0.34: Predicted Daily Mean NO_x Concentrations ($\mu g/m^3$)

Receptor	NO_x Process Contribution ($\mu g/m^3$)	Background ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC% of EAL	
				EAL 75$\mu g/m^3$	EAL 200$\mu g/m^3$
Burnham Beeches	0.54	16.4	16.9	22.5%	8.4%
Chiltern Beechwoods	0.11	15.1	15.2	20.2%	7.6%
Windsor Forest 1	0.35	16.5	16.8	22.4%	8.4%
Windsor Forest 2	0.32	14.7	15.0	20.0%	7.5%
South West London 1	0.29	19.9	20.2	26.9%	10.1%
South West London 2	0.27	22.4	22.6	30.2%	11.3%
Haymill Valley LNR	1.22	27.2	28.4	37.9%	14.2%
Dorney Common and Cress Brook	1.36	27.6	29.0	38.7%	14.5%
Railway Triangle 1	1.17	31.1	32.3	43.0%	16.1%
Railway Triangle 2	1.00	31.1	32.1	42.8%	16.0%
Jubilee River and Dorney Wetlands 1	1.34	23.1	24.4	32.6%	12.2%
Jubilee River and Dorney Wetlands 2	1.68	27.6	29.3	39.1%	14.7%

All of the predicted process contributions are insignificant.

5.2.2.4 CyrusOne 5 Critical Load

The maximum predicted nitrogen and acid deposition within the habitats are shown in 5.35 and 5.36.

Table 0.35: Maximum Nitrogen Deposition

Site	Critical Load (kg/ha/yr)	PC (kg/ha/yr)	% PC of Critical Load
Burnham Beeches	10	0.000004	0.00004%
Chiltern Beechwoods	10	0.000001	0.00001%
Windsor Forest 1	10	0.000002	0.00002%
Windsor Forest 2	10	0.000002	0.00002%
South West London 1	20	0.000001	0.00001%
South West London 2	20	0.000001	0.00001%
Haymill Valley LNR	10	0.000011	0.00011%
Dorney Common and Cress Brook	10	0.000005	0.00005%
Railway Triangle 1	10	0.000025	0.00025%
Railway Triangle 2	10	0.000023	0.00023%
Jubilee River and Dorney Wetlands 1	10	0.000008	0.00008%
Jubilee River and Dorney Wetlands 2	10	0.000008	0.00008%

Table 0.36: Maximum nitrogen acid deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	1.9	0.0000003	0.000014%
Chiltern Beechwoods	2.1	0.0000000	0.000002%
Windsor Forest 1	2.2	0.0000002	0.000008%
Windsor Forest 2	2.2	0.0000002	0.000007%
South West London 1	1.3	0.0000001	0.000008%

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
South West London 2	1.3	0.0000001	0.000008%
Haymill Valley LNR	1.08	0.0000008	0.000072%
Dorney Common and Cress Brook	1.12	0.0000004	0.000034%
Railway Triangle 1	2.01	0.0000018	0.000090%
Railway Triangle 2	2.01	0.0000016	0.000080%
Jubilee River and Dorney Wetlands 1	1.12	0.0000006	0.000051%
Jubilee River and Dorney Wetlands 2	1.12	0.0000006	0.000051%

The maximum predicted nitrogen and nitrogen acid depositions at each of the receptors is well below 1% of the relevant critical load and therefore insignificant.

The maximum predicted SO_2 acid deposition within the habitats is shown in Table 5.37. The combined total acid deposition is presented in Table 5.38.

Table 0.37: Maximum SO_2 Deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	10	0.000002	0.00002%
Chiltern Beechwoods	10	0.000000	0.00000%
Windsor Forest 1	10	0.000001	0.00001%
Windsor Forest 2	10	0.000001	0.00001%
South West London 1	10	0.000001	0.00001%
South West London 2	10	0.000001	0.00001%
Haymill Valley LNR	10	0.000006	0.00006%
Dorney Common and Cress Brook	10	0.000002	0.00002%

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Railway Triangle 1	10	0.000010	0.00010%
Railway Triangle 2	10	0.000009	0.00009%
Jubilee River and Dorney Wetlands 1	10	0.000003	0.00003%
Jubilee River and Dorney Wetlands 2	10	0.000004	0.00004%

Table 0.38: Maximum SO_2 acid deposition

Site	Critical Load (keq/ha/yr)	PC (keq/ha/yr)	% PC of Critical Load
Burnham Beeches	0.2	0.0000001	0.00005%
Chiltern Beechwoods	0.2	0.0000000	0.00001%
Windsor Forest 1	0.2	0.0000001	0.00003%
Windsor Forest 2	0.2	0.0000001	0.00003%
South West London 1	0.2	0.0000000	0.00002%
South West London 2	0.2	0.0000000	0.00002%
Haymill Valley LNR	0.15	0.0000004	0.00024%
Dorney Common and Cress Brook	0.13	0.0000001	0.00011%
Railway Triangle 1	0.21	0.0000006	0.00029%
Railway Triangle 2	0.21	0.0000005	0.00026%
Jubilee River and Dorney Wetlands 1	0.13	0.0000002	0.00015%
Jubilee River and Dorney Wetlands 2	0.13	0.0000002	0.00017%

0.39: Total Acid Deposition (Nitrogen and SO_2 combined)

Site	Acidity Critical Load (keq) MinCLMaxN	PC (kg/ha/yr)	% PC of Critical Load
Burnham Beeches	2.1	0.0000004	0.00002%
Chiltern Beechwoods	1.6	0.0000001	0.00000%
Windsor Forest 1	2.7	0.0000002	0.00001%
Windsor Forest 2	2.7	0.0000002	0.00001%
South West London 1	1.1	0.0000001	0.00001%
South West London 2	1.1	0.0000001	0.00001%
Haymill Valley LNR	2.658	0.0000011	0.00004%
Dorney Common and Cress Brook	4.856	0.0000005	0.00001%
Railway Triangle 1	1.711	0.0000024	0.00014%
Railway Triangle 2	1.711	0.0000022	0.00013%
Jubilee River and Dorney Wetlands 1	4.856	0.0000008	0.00002%
Jubilee River and Dorney Wetlands 2	4.856	0.0000008	0.00002%

The maximum predicted SO_2 and total acid deposition at each of the receptors is well below 1% of the relevant critical load and therefore insignicant.

5.2.3 Scenario 2

As discussed above in section 5.1.3, the Scenarios results for all pollutants are not presented as no exceedances of the PCs would be expected based on the results of the emergency operation scenario.