Redmore environmental

Air Quality Assessment
Spring Park Data Centre, Corsham
Environmental Permit: EPR/PP3003PW/V002

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Executive Summary

Redmore Environmental Ltd was commissioned by EHS Projects Ltd to undertake an Air Quality Assessment in relation to Spring Park Data Centre, Westwells Road, Corsham.

Atmospheric emissions from diesel-fired standby generators at the site have the potential to cause air quality impacts at sensitive locations. As such, an Air Quality Assessment was undertaken in order to quantify potential effects during the following three operating scenarios:

- Event 1 - Standby generator test;
- Event 2 - Annual service test; and,
- Event 3 - Grid outage event.

Dispersion modelling was undertaken in order to predict pollutant concentrations at sensitive locations as a result of emissions from the relevant sources. The results indicated that impacts were not predicted to be significant during any of the three Event scenarios.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by EHS Projects Ltd to undertake an Air Quality Assessment in relation to Spring Park Data Centre, Westwells Road, Corsham.

1.1.2 Atmospheric emissions from diesel-fired standby generators at the site have the potential to cause air quality impacts at sensitive locations. As such, an Air Quality Assessment was undertaken in order to quantify potential effects during different operating scenarios.

1.2 Site Location and Context

1.2.1 Spring Park Data Centre is located on land off Westwells Road, Corsham, Wiltshire, SN13 9GB, at National Grid Reference (NGR): 384831, 168835. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 Spring Park Data Centre operates in accordance with Environmental Permit EPR/PP3003PW/V002 and consists of 5 units known as SQ17, P1, P2, P3 and P4 located on Westwells Road within the Spring Park industrial estate. Electricity for operation of the data centres is provided by five connections to the National Grid. Due to the need to ensure availability of uninterrupted power supply at all times, the site incorporates 54 diesel-fired standby generators. These are oriented as follows:

- HV Gen Farm (Buildings P3 & P4): 24 standby generators;
- Building P2: 12 standby generators;
- Building P1: 10 standby generators; and,
- Building SQ17: 8 standby generators.

1.2.3 It is proposed to install a further 16 standby generators at the SQ19 Substation to support the new data centre P5, which is currently in the early stages of construction and due for commissioning in Q4 2024.

1.2.4 Reference should be made to Figure 2 for a site layout plan.

1.2.5 Operation of the additional generators has the potential to affect overall emissions from the installation. As such, an Air Quality Assessment has been undertaken in order to quantify potential impacts at sensitive locations. This is provided in the following report.

1.2.6 It should be noted that Air Quality Assessments were produced by Redmore Environmental Ltd in support of the Environmental Permit Variation Application[1] for the facility and subsequently to address the requirements of Improvement Condition IC4 of the Environmental Permit for the plant[2]. These were partly based on the original Air Quality Detailed Modelling Assessment[3] produced in support of the Environmental Permit Application. The most recent version was issued in November 2021[4] following discussions with the Environment Agency (EA) and subsequent amendments to address the relevant comments. All reports were reviewed and the inputs and methodology utilised as far as practicable to allow continuity throughout the assessments.

1 Air Quality Assessment, Spring Park Data Centre, Corsham, Environmental Permit: EPR/PP3003PW, Redmore Environmental Ltd, 2021.

2 Air Quality Assessment, Spring Park Data Centre, Corsham, Environmental Permit: EPR/PP3003PW, Redmore Environmental Ltd, 2022.

3 Spring Park, Corsham SN13 9GB Air Quality Detailed Modelling Assessment, Waterman Infrastructure & Environment Limited, 2019.

4 Air Quality Assessment, Spring Park Data Centre, Corsham, Environmental Permit: EPR/PP3003PW, Redmore Environmental Ltd, 2021.

2.0 LEGISLATION AND POLICY

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for 7 pollutants, as well as Target Values for an additional 5 pollutants.

2.1.2 The Air Quality Strategy (AQS) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published on 28th April 2023[5]. The document contains standards, objectives and measures for improving ambient air quality, including a number of Air Quality Objectives (AQOs). These are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedences over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

2.1.3 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration ($\mu g/m^3$)	Averaging Period
Nitrogen dioxide (NO_2)	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum
Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10})	40	Annual mean
	50	24-hour mean, not to be exceeded on more than 35 occasions per annum
Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$)	20	Annual mean
Sulphur dioxide (SO_2)	125	24-hour mean; not to be exceeded more than 3 times per annum

5 The AQS: Framework for Local Authority Delivery, DEFRA, 2023.

Pollutant	Air Quality Objective	
	Concentration (µg/m³)	Averaging Period
	350	1-hour mean; not to be exceeded more than 24 times per annum
	266	15-minute mean; not to be exceeded more than 35 times per annum
Carbon monoxide (CO)	10,000	8-hour running mean

2.2 Local Air Quality Management

2.2.1 Local Authorities are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves comparing present and likely future pollutant concentrations against the AQOs. If it is predicted that levels at locations of relevant exposure are likely to be exceeded, the Local Authority is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.3 Industrial Pollution Control Legislation

2.3.1 Atmospheric emissions from industry are controlled in England through the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. The operations undertaken at the site are included within the Regulations and as such the facility is required to operate in accordance with an Environmental Permit issued by the Environment Agency (EA). Compliance with any conditions of the permit must be demonstrated through periodic monitoring requirements, which have been set in order to limit potential impacts in the surrounding area.

2.4 Environmental Assessment Levels

2.4.1 An Environmental Assessment Level (EAL) is the concentration of a substance, which, in a particular environmental medium, the regulators regard as an appropriate value to enable a comparison between the environmental effects of different substances in that medium and between environmental effects in different media, enabling the summation of those effects.

2.4.2 Ideally EALs to fulfil this objective would be defined for each pollutant:

- Based on the sensitivity of particular habitats or receptors (in particular three main types of receptor should be considered, protection of human health, protection of natural ecosystems and protection of specific sensitive receptors, e.g. materials, commercial activities requiring a particular environmental quality);
- Be produced according to a standardised protocol to ensure that they are consistent, reproducible and readily understood;
- Provide similar measure of protection for different receptors both within and between media; and,
- Take account of habitat specific environmental factors such as pH, nutrient status, bioaccumulation, transfer and transformation processes where necessary.

2.4.3 EALs used in this assessment were obtained from EA guidance[6] and are summarised in Table 2.

Table 2 Environmental Assessment Levels

Pollutant	Environmental Assessment Level	
	Concentration (μg/m^3)	Averaging Period
Formaldehyde (CH_2O)	5	Annual mean
	100	1-hour mean

2.5 Acute Exposure Guideline Levels

2.5.1 The United States Environmental Protection Agency (US EPA) have developed Acute Exposure Guideline Levels (AEGLs) which are used by emergency planners and responders worldwide as guidance in dealing with rare, usually accidental, releases of chemicals into the air. AEGLs are expressed as specific concentrations of airborne pollutants at which health effects may occur. They are designed to protect the elderly

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

and children, and other individuals who may be susceptible and are sensitive to atmospheric pollution.

2.5.2 AEGLs are calculated for five short exposure periods with 'levels' ranging from 1 to 3 based on the severity of the toxic effects caused by the exposure. These are described as follows:

- Level 1: Notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure;
- Level 2: Irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape; and,
- Level 3: Life-threatening health effects or death.

2.5.3 The relevant AEGLs are summarised in Table 3.

Table 3 Acute Exposure Guideline Levels

Pollutant	Acute Exposure Guideline Level (ppm)					
	Level	Averaging Period				
		10-minutes	30-minutes	60-minutes	4-hours	8-hours
NO_2	1	0.5	0.5	0.5	0.5	0.5
	2	20.0	15.0	12.0	8.2	6.7
	3	34.0	25.0	20.0	14.0	11.0
SO_2	1	0.2	0.2	0.2	0.2	0.2
	2	0.75	0.75	0.75	0.75	0.75
	3	30.0	30.0	30.0	30.0	30.0
CO	1	N/A	N/A	N/A	N/A	N/A
	2	420	150	83	33	27
	3	1,700	600	330	150	130
CH_2O	1	0.9	0.9	0.9	0.9	0.9
	2	14.0	14.0	14.0	14.0	14.0
	3	100	70.0	56.0	35.0	35.0

2.6 Critical Loads and Levels

2.6.1 A critical load is defined by the UK Air Pollution Information System (APIS)[7] as:

> "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. The exceedance of a critical load is defined as the atmospheric deposition of the pollutant above the critical load."

2.6.2 A critical level is defined as:

> "Threshold for direct effects of pollutant concentrations according to current knowledge. Exceedance of a critical level is defined as the atmospheric concentration of the pollutant above the critical level."

2.6.3 A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

2.6.4 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedence. A larger exceedence is often considered to represent a greater risk of damage.

2.6.5 Maps of critical loads and levels and their exceedences have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedence may infer that less damage will occur.

2.6.6 Table 4 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

[7] UK Air Pollution Information System, www.apis.ac.uk.

Table 4 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration (μg/m³)	Averaging Period
Oxides of nitrogen (NO_x)	30	Annual mean
	75	24-hour mean
SO_2	10	Annual mean

2.6.7 Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been identified for the relevant designations considered within the assessment in Section 3.5.

3.0 BASELINE

3.1 Introduction

3.1.1 Existing air quality conditions in the vicinity of the site were identified in order to provide a baseline for assessment. These are detailed in the following Sections.

3.2 Local Air Quality Management

3.2.1 As required by the Environment Act (1995), Wiltshire Council (WC) has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that concentrations of NO_2 and PM_{10} are above the AQOs within their area of jurisdiction. As such, eight AQMAs have been declared. The closest to the site is Bradford-on-Avon AQMA which has been designated due to exceedences of the annual mean NO_2 and PM_{10} AQOs. This is described as follows:

> "The following roads and buildings with facades on the roads Masons Lane, Market Street, Silver Street, St Margarets Street"

3.2.2 The facility is located approximately 7.7km north-east of the AQMA. It is not considered likely that emissions would significantly affect air quality over a distance of this magnitude. As such, the AQMAs have not been considered further in the context of the assessment.

3.2.3 WC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs. As such, no further AQMAs have been designated.

3.3 Air Quality Monitoring

3.3.1 Monitoring of NO_2 concentrations is undertaken by WC throughout their area of jurisdiction. However, the closest survey site to the facility is located approximately 1.9km south-west of the boundary. Due to the distance between the locations, similar pollutant concentrations would not be anticipated at the two positions. As such, this source of information was not considered further in the context of the assessment.

3.4 Background Pollutant Concentrations

3.4.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by DEFRA for the entire of the UK to assist Local Authorities in their Review and Assessment of air quality. The site is located in grid square NGR: 384500, 168500. Data for this location was downloaded from the DEFRA website[8] for the purpose of the assessment and is summarised in Table 5.

Table 5 Background Pollutant Concentration Predictions

Pollutant	Predicted Background Pollutant Concentration (μg/m^3)
NO_2	5.90
SO_2	2.11
CO	234
Benzene (C_6H_6)[(a)]	0.202
PM_{10}	12.43
$PM_{2.5}$	7.74

NOTE: (a) Used to represent background CH_2O concentrations in accordance with the approach adopted in the original Air Quality Detailed Modelling Assessment.

3.4.2 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ are predicted for 2023, C_6H_6 for 2010 and SO_2 and CO for 2001. These were the most recent predictions available at the time of assessment and are therefore considered to provide a reasonable representation of background concentrations in the vicinity of the site.

3.5 Sensitive Receptors

3.5.1 A sensitive receptor is defined as any location which may be affected by changes in air quality. These have been defined for human and ecological receptors in the following Sections.

8 http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html.

Sensitive Human Receptors

3.5.2 A desk-top study was undertaken in order to identify any sensitive human receptor locations in the vicinity of the site that required specific consideration during the assessment. These are summarised in Table 6.

Table 6 Sensitive Human Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	68 Westwells	385239.6	168903.8
R2	26 The Links	384544.3	169404.9
R3	The Retreat, Bradford Road	384256.3	169104.3
R4	Glenhaven, Bradford Road	384249.1	168680.2
R5	31 Moor Park	385443.6	168781.5
R6	Jaggards House	385435.2	168536.8
R7	Westwells Road	384781.7	169169.0
R8	Roundwood Cottage	384785.0	168498.2

3.5.3 Reference should be made to Figure 3 for a map of the sensitive human receptor locations.

Ecological Receptors

3.5.4 Atmospheric emissions from the facility have the potential to impact on receptors of ecological sensitivity within the vicinity of the site. A pre-application request was therefore submitted to the EA in order to identify relevant sites of ecological or nature conservation importance for inclusion in the assessment. The response indicated the following designations within the relevant distances:

- Bath & Bradford on Avon Bats Special Area of Conservation (SAC);
- Box Mine Site of Special Scientific Interest (SSSI);
- Corsham Railway Cutting SSSI;
- Box Hill Common Local Wildlife Site (LWS);

- By Brook LWS;
- Hungerford Wood LWS;
- Tilley's Wood LWS;
- White Wood, Box LWS;
- White Wood Ancient Woodland (AW);
- Hazelbury Fields LWS;
- Hazelbury Fields LWS;
- Privett's Wood LWS;
- Privett's Wood AW;
- Hazelbury Common LWS;
- Hazelbury Common LWS;
- Kingsmoor Wood LWS;
- Kingsmoor Wood AW;
- Botleaze Wood LWS; and,
- Cottles Wood AW.

3.5.5 For the purpose of the modelling assessment discrete receptors were placed at the closest points of each designation to the facility to ensure the maximum potential impact was predicted. These are summarised in Table 7.

Table 7 Ecological Receptor Locations

Receptor		NGR (m)	
		X	Y
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383540.9	168387.5
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383693.2	168564.8
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383593.2	168780.9
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	383877.4	168990.1
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	384088.9	169128.8
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	384186.7	169162.9
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	384375.5	169203.9
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	384443.7	169401.7

Receptor		NGR (m)	
		X	Y
E9	Corsham Railway Cutting SSSI	385794.5	169394.9
E10	By Brook LWS	383221.8	169930.9
E11	By Brook LWS	383011.6	169608.5
E12	By Brook LWS	382954.3	169534.5
E13	By Brook LWS	382897.0	169491.5
E14	By Brook LWS	382801.5	169369.7
E15	By Brook LWS	382720.3	169207.3
E16	By Brook LWS	382682.1	169025.8
E17	Hungerford Wood LWS	383297.1	170477.6
E18	Tilley's Wood LWS	383225.2	170345.4
E19	White Wood, Box LWS and AW	383220.1	167845.7
E20	Hazelbury Fields LWS	383255.0	167912.0
E21	Hazelbury Fields LWS	383642.5	167660.6
E22	Privett's Wood LWS and AW	383513.4	167974.9
E23	Hazelbury Common LWS	383914.9	167789.8
E24	Hazelbury Common LWS	383705.4	167758.4
E25	Kingsmoor Wood LWS and AW	384757.0	168441.5
E26	Botleaze Wood LWS	384787.6	167033.0
E27	Cottles Wood AW	385154.3	166769.1

3.5.6 Reference should be made to Figure 3 for a map of the ecological receptors.

3.5.7 Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS[9] and MAGIC[10] websites, as well as the relevant site designations and publicly available information, was undertaken in order

9 http://www.apis.ac.uk/.

10 Multi-Agency Geographic Information for the Countryside, www.magic.gov.uk.

to identify the most suitable habitat description and associated critical load for the area of each designation considered within the assessment.

3.5.8 The relevant nitrogen deposition critical loads are presented in Table 8.

Table 8 Critical Loads for Nitrogen Deposition

Receptor		Feature	APIS Habitat	Nitrogen Critical Load (kgN/ha/yr)	
				Low	High
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	10	20
E9	Corsham Railway Cutting SSSI	-	-	-	-
E10	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20

Receptor		Feature	APIS Habitat	Nitrogen Critical Load (kgN/ha/yr)	
				Low	High
E11	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E12	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E13	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E14	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E15	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E16	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E17	Hungerford Wood LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E18	Tilley's Wood LWS	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E19	White Wood, Box LWS and AW	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E20	Hazelbury Fields LWS	Calcareous grassland	Sub-atlantic semi-dry calcareous grassland	15	25
E21	Hazelbury Fields LWS	Calcareous grassland	Sub-atlantic semi-dry calcareous grassland	15	25
E22	Privett's Wood LWS and AW	Broadleaved, Mixed and Yew Woodland	Broadleaved deciduous woodland	10	20
E23	Hazelbury Common LWS	Calcareous grassland	Sub-atlantic semi-dry calcareous grassland	15	25
E24	Hazelbury Common LWS	Calcareous grassland	Sub-atlantic semi-dry calcareous grassland	15	25

3.5.9 The site features were also reviewed to identify the habitat types most sensitive to acid deposition. These are summarised in Table 9.

Table 9 Critical Loads for Acid Deposition

Receptor		Feature	APIS Habitat	Acid Critical Load (keq/ha/yr)		
				CLMinN	CLMaxS	CLMaxN
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	Rhinolophus hipposideros - Lesser horseshoe bat	Broadleaved, mixed and yew woodland	0.142	10.935	11.077
E9	Corsham Railway Cutting SSSI	-	-	-	-	-
E10	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173

Receptor		Feature	APIS Habitat	Acid Critical Load (keq/ha/yr)		
				CLMinN	CLMaxS	CLMaxN
E11	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173
E12	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173
E13	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173
E14	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173
E15	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173
E16	By Brook LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.959	11.173
E17	Hungerford Wood LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.142	10.919	11.061
E18	Tilley's Wood LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.923	11.137
E19	White Wood, Box LWS and AW	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.142	10.944	11.086
E20	Hazelbury Fields LWS	Calcareous grassland	Calcareous grassland	0.856	4	4.856
E21	Hazelbury Fields LWS	Calcareous grassland	Calcareous grassland	0.856	4	4.856

Receptor		Feature	APIS Habitat	Acid Critical Load (keq/ha/yr)		
				CLMinN	CLMaxS	CLMaxN
E22	Privett's Wood LWS and AW	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.142	10.944	11.086
E23	Hazelbury Common LWS	Calcareous grassland	Calcareous grassland	0.856	4	4.856
E24	Hazelbury Common LWS	Calcareous grassland	Calcareous grassland	0.856	4	4.856
E25	Kingsmoor Wood LWS and AW	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.142	10.95	11.092
E26	Botleaze Wood LWS	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.142	10.946	11.088
E27	Cottles Wood AW	Broadleaved, Mixed and Yew Woodland	Broadleafed/ Coniferous unmanaged woodland	0.214	10.883	11.097

3.5.10 Baseline pollutant concentrations and deposition rates at each ecological receptor were obtained from the APIS[11] website and are summarised in Table 10.

Table 10 Baseline Pollution Levels at Ecological Receptors

Receptor		Annual Mean NO_x Conc. (µg/m³)	Annual Mean SO_2 Conc. (µg/m³)	Baseline Deposition Rate		
				Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)	
					N.	S.
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	15.45	0.81	32.60	2.3	0.2
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	15.45	0.81	32.60	2.3	0.2
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	15.45	0.81	32.60	2.3	0.2

11 http://www.apis.ac.uk/.

Receptor		Annual Mean NO_x Conc. (µg/m³)	Annual Mean SO_2 Conc. (µg/m³)	Baseline Deposition Rate		
				Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)	
					N.	S.
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	15.45	0.81	32.60	2.3	0.2
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	15.45	0.81	32.60	2.3	0.2
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	15.45	0.81	32.60	2.3	0.2
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	15.45	0.81	32.60	2.3	0.2
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	15.45	0.81	32.60	2.3	0.2
E9	Corsham Railway Cutting SSSI	15.45	0.8	22.40	1.6	0.14
E10	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E11	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E12	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E13	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E14	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E15	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E16	By Brook LWS	15.45	0.79	32.62	2.33	0.17
E17	Hungerford Wood LWS	15.45	0.75	32.90	2.35	0.17
E18	Tilley's Wood LWS	15.45	0.75	32.90	2.35	0.17
E19	White Wood, Box LWS and AW	15.45	0.79	32.62	2.33	0.17
E20	Hazelbury Fields LWS	15.45	0.79	19.32	1.38	0.14
E21	Hazelbury Fields LWS	15.45	0.79	19.32	1.38	0.14
E22	Privett's Wood LWS and AW	15.45	0.79	32.62	2.33	0.17
E23	Hazelbury Common LWS	15.45	0.79	19.32	1.38	0.14
E24	Hazelbury Common LWS	15.45	0.79	19.32	1.38	0.14
E25	Kingsmoor Wood LWS and AW	15.45	0.79	32.62	2.33	0.17

Receptor		Annual Mean NO_x Conc. (μg/m³)	Annual Mean SO_2 Conc. (μg/m³)	Baseline Deposition Rate		
				Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)	
					N.	S.
E26	Botleaze Wood LWS	15.45	0.79	32.62	2.33	0.17
E27	Cottles Wood AW	15.45	0.8	38.22	2.73	0.18

4.0 METHODOLOGY

4.1 Introduction

4.1.1 Emissions from the site have the potential to contribute to elevated pollutant concentrations at sensitive locations. These have been quantified through dispersion modelling in accordance with the methodology outlined in the following Sections.

4.2 Dispersion Model

4.2.1 Dispersion modelling was undertaken using ADMS-6.0 (v6.0.0.1), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-6 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

4.2.2 The model utilises hourly meteorological data to define conditions for plume rise, transport and diffusion. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected long-term and short-term averages.

4.3 Modelling Scenarios

4.3.1 The events considered in the modelling assessment can be summarised as follows:

- Event 1 (a) - Standby generator test (no load). Each bank of standby generators is tested monthly when Event 1 (b) and Event 2 are not being undertaken. This involves simultaneous operation of the bank at 0% of full load for 15-minutes;
- Event 1 (b) - Standby generator test (80% load). Each bank of standby generators is tested three times per annum. This involves simultaneous operation of the bank at 80% of full load for 15-minutes;
- Event 2 - Annual service test. Each generator is tested once per annum. This involves operation of a single generator at 100% of full load for 2-hours. No other engines are operational during this period; and,

- Event 3 - Grid outage event. In the event of a power outage all standby generators would operate until supply is resumed. As discussed and agreed with the local EA Site Inspector, it has been assumed that operation would occur for a maximum of 72-hours. This is based on the resilience of the grid connections to the site, the resilience of the on-site systems and the amount of fuel stored on site as part of contractual obligation.

4.3.2 It should be noted that Event 1 (b) results in higher emissions than Event 1(a) as the generators are operated at a higher load. As such, this was the scenario considered throughout the modelling assessment and referred to as 'Event 1' for brevity.

4.3.3 The events have been represented within the model as summarised in the following Sections. Predicted pollutant concentrations were summarised in the following formats:

- Process contribution (PC) - Predicted pollutant level as a result of emissions from the facility only; and,
- Predicted environmental concentration (PEC) - Total predicted pollutant level as a result of emissions from the facility and existing baseline conditions.

4.3.4 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant AQOs, AEGLs and critical level. These criteria are collectively referred to as Environmental Quality Standards (EQSs).

Event 1

4.3.5 For Event 1, emissions from each bank of generators were modelled constantly. The maximum predicted concentration for each averaging period was then identified and compared to the relevant EQS. This significantly overestimates impacts as constant operation has been assumed to ensure a full range of meteorological conditions were included in the results. Additional analysis of any EQS exceedence was provided as necessary.

4.3.6 During Event 1 the generators are run for 15-minutes. As such, emissions are unlikely to significantly affect concentrations for averaging periods greater than 30-minutes. The model outputs are therefore summarised in Table 11.

Table 11 Event 1 Model Outputs

Pollutant	Modelled As	EQS (µg/m³)(a)
NO_2	Maximum 10-minute mean	941
	Maximum 30-minute mean	941
CH_2O	Maximum 10-minute mean	1,105
	Maximum 30-minute mean	941
CO	Maximum 10-minute mean	481,156
	Maximum 30-minute mean	171,841
SO_2	Maximum 10-minute mean	524(b)
	Maximum 30-minute mean	524

NOTE: (a) Converted from ppm.
(b) Results also considered in the context of the 15-minute AQO of 266µg/m³.

Event 2

4.3.7 For Event 2, emissions from each generator were modelled constantly. The maximum predicted concentration for each averaging period was then identified and compared to the relevant EQS. This significantly overestimates impacts as constant operation has been assumed to ensure a full range of meteorological conditions were included in the results. If exceedences of the EQSs were identified, then the input parameters would have been amended to more accurately represent actual emissions.

4.3.8 During Event 2 each generator is run for 2-hours. As such, emissions are unlikely to significantly affect concentrations for averaging periods greater than 2-hours. The model outputs are therefore summarised in Table 12.

Table 12 Event 2 Model Outputs

Pollutant	Modelled As	EQS (µg/m³)(a)
NO_2	Maximum 1-hour mean	941(b)
CH_2O	Maximum 1-hour mean	100
CO	Maximum 1-hour mean	95,086
SO_2	Maximum 1-hour mean	524(c)

NOTE: (a) Converted from ppm where relevant.
(b) Results also considered in the context of the AQO of 200µg/m^3.
(c) Results also considered in the context of the AQO of 350µg/m^3.

4.3.9 It should be noted that the modelling of Event 1 considered simultaneous emissions from entire generator banks, rather than individual units. As such, 10-minute and 30-minute outputs were not defined from Event 2 as they would be lower than those for Event 1.

Event 3

4.3.10 For Event 3 emissions from all generators were modelled constantly to ensure a full range of meteorological conditions were included in the outputs. The following loads were represented within the assessment based on the specific design of each bank:

- HV Gen Farm (Buildings P3 & P4): 50% load;
- Building P2: 50% load;
- Building P1: generators G1 to G7 - 66% load;
- Building P1: generators G8 to G12 - 75% load;
- Building SQ17: generators G1 and G2 - 50% load;
- Building SQ17: generators G3 to G8 - 66% load; and,
- Building SQ19: 88% load.

4.3.11 It should be noted that where emissions data was unavailable for specific loadings, values for a higher output were utilised as a worst-case.

4.3.12 The approach to analysis of the results is summarised in the following Sections.

Human Receptors

4.3.13 The EA have issued guidance[12] on dispersion modelling of emissions from back-up generating plant. This includes a method for statistical analysis using the hypergeometric probability distribution in order to identify the potential for an exceedence of the 1-hour AQO for NO_2 for facilities that operate periodically on an undefined schedule.

12 Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, EA, 2018.

4.3.14 For Event 3, an operating period of 72-hours per annum was assumed. Using the hypergeometric probability distribution method, it was determined that should the results indicate 1,430 or more instances of NO_2 concentrations over 200µg/m^3 within a year, then the probability of producing 19 instances of NO_2 concentrations over 200µg/m^3, and therefore an exceedence of the AQO, within 72 operational hours would be 2.0%. As the plant can operate for periods in excess of 4-hours, this value was multiplied by 2.5 in accordance with the guidance[13]. This provided a probability of 4.9%. The EA indicate that:

> "A probability of less than 5% indicates exceedances are unlikely, provided the generator plant operational lifetime is no more than 20 years."

4.3.15 Although the generator plant operational lifetime may exceed 20-years, grid outages of 72-hour duration are extremely unlikely. As such, this level of probability is considered to be acceptable and therefore an appropriate criterion for use in the assessment.

4.3.16 Based on the number of instances determined previously, the 83.68th percentile (%ile) was calculated for use in the modelling assessment. As such, should predicted 83.68th %ile 1-hour mean NO_2 concentrations be under 200µg/m^3 then there is less than 5% probability of an AQO exceedence and impacts are not considered significant in accordance with the utilised guidance[14].

4.3.17 The maximum predicted concentrations of CH_2O, CO and SO_2 for each averaging period were identified and compared to the relevant EQS. This significantly overestimates impacts of these pollutants as constant operation has been assumed to ensure a full range of meteorological conditions were included in the results. If exceedences of the EQSs were identified, then the input parameters would have been amended to more accurately represent actual emissions.

4.3.18 The duration of Event 3 was assumed as 72-hours. As such, emissions are unlikely to significantly affect concentrations for averaging periods greater than 24-hours, or the 24-hour mean AQO for PM_{10} as 35 exceedences are permitted per annum. The model outputs for human receptors are therefore summarised in Table 13.

13 Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, EA, 2018.

14 Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, EA, 2018.

Table 13 Event 3 Model Outputs: Human Receptors

Pollutant	Modelled As	EQS (µg/m³)[(a)]
NO_2	83.68th %ile 1-hour mean	200
	Maximum 1-hour mean	941
CH_2O	Maximum 1-hour mean	100
CO	Maximum 8-hour rolling mean	10,000
SO_2	Maximum 1-hour mean	350
	Maximum 1-hour mean	524

NOTE: (a) Converted from ppm where relevant.

Ecological Receptors

4.3.19 Event 3 has the potential to affect 24-hour mean NO_x concentrations at sensitive ecological receptors. The potential risk of EQS exceedence was therefore considered using a staged approach.

4.3.20 The first step in the analysis involved utilising the 'exceedence thresholds' function of ADMS-5. This allows the user to define a threshold value and the model provides an output defined as the 'number of exceedences per annum of each concentration threshold value'.

4.3.21 The threshold value was calculated by deducting the short-term baseline concentration of 30.9µg/m^3, defined as twice the annual mean baseline NO_x concentration, from the 24-hour mean NO_x EQS. This resulted in a threshold concentration of 44.1µg/m^3.

4.3.22 The number of exceedences of the defined threshold concentration was then calculated using ADMS-5. The number of threshold exceedences represent the number of days within a year where the 24-hour NO_x EQS would be exceeded based on 24-hour operation, 365-days per year.

4.3.23 The next step involved determining the 'probability of exceedence' occurring by dividing the maximum number of exceedence days by the numbers of days in a year.

4.3.24 The 'probability of exceedence' assumes that the plant is operational 24-hours a day, 365-days a year. However, the duration of Event 3 is 72-hours. As such, the 'probability of operation' was calculated as 0.8% i.e 3-days in every 365.

4.3.25 The final step in the analysis involved combining the 'probability of operation' with the 'probability of exceedence' to give the 'probability of operational exceedence'. This value represented the probability that an EQS exceedence occurs within a given year should a 72-hour grid outage arise.

Long Term Averaging Periods

4.3.26 Previous correspondence with the EA indicated a requirement to consider long term pollutant averaging periods. As such, modelling was also undertaken for the parameters outlined in Table 14.

Table 14 Long Term Pollutant Averaging Periods

Pollutant	Receptor Type	Modelled As	EQS (μg/m^3)[a]
NO_2	Human	Annual mean	40
PM_{10}	Human	Annual mean	40
$PM_{2.5}$	Human	Annual mean	20
NO_x	Ecological	Annual mean	30
SO_2	Ecological	Annual mean	10
Nitrogen deposition	Ecological	Annual	As outlined in Table 8
Acid deposition	Ecological	Annual	As outlined in Table 9

4.3.27 To predict annual mean concentrations, constant operation of all generators using the input parameters for Event 1 was undertaken as a worst-case, prior to factoring the results to represent a total operational period of 76.75-hours per annum. This consisted of:

- Event 1: 2.75-hours;
- Event 2: 2-hours; and,
- Event 3: 72-hours.

4.3.28 Daily PM_{10} concentrations were predicted based on constant operation of all generators using the input parameters for Event 1 as a worst-case.

4.4 Source Parameters

4.4.1 A summary of the source parameters used in the assessment for Events 1 and 2 is provided in Table 15. These were provided by the applicant, obtained from the original Air Quality Detailed Modelling Assessment[15] which was accepted by the EA or calculated from the relevant technical data sheets for the generators. Additional emission and exhaust gas parameters for Event 3 were calculated from the relevant engine data sheets for the associated part loading during grid outage events. It should be noted that the DS2500 engines associated with the HV Gen Farm have two exhausts. These were therefore represented by two point sources within the model.

15 Spring Park, Corsham SN13 9GB Air Quality Detailed Modelling Assessment, Waterman Infrastructure & Environment Limited, 2019.

Redmore environmental

Table 15 Source Parameters - Events 1 and 2

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
GS1	SQ17-1	1,600	4.52	0.40	44.56	510	384544.0	168839.0	1.93	0.03	0.04	0.21	0.00137
GS2	SQ17-1	1,600	4.52	0.40	44.56	510	384548.0	168838.0	1.93	0.03	0.04	0.21	0.00137
GS3	SQ17-1	1,520	4.52	0.40	40.98	539	384589.0	168827.0	6.58	0.97	0.19	0.17	0.00121
GS4	SQ17-1	1,520	4.52	0.40	40.98	539	384592.0	168827.0	6.58	0.97	0.19	0.17	0.00121
GS5	SQ17-1	1,520	4.52	0.40	40.98	539	384596.0	168826.0	6.58	0.97	0.19	0.17	0.00121
GS6	SQ17-1	1,760	5.88	0.52	37.49	524	384574.4	168893.0	5.38	1.75	0.13	0.40	0.00121
GS7	SQ17-1	1,760	5.88	0.52	37.49	524	384575.5	168897.4	5.38	1.75	0.13	0.40	0.00121
GS8	SQ17-1	1,760	5.88	0.52	37.49	524	384576.7	168901.9	5.38	1.75	0.13	0.40	0.00121
G1	P1	1,000	4.95	0.25	33.42	525	384798.5	168815.7	1.34	0.33	0.02	0.03	0.00101
G2	P1	1,000	4.95	0.25	33.42	525	384794.6	168813.9	1.34	0.33	0.02	0.03	0.00101
G3	P1	1,000	4.95	0.25	33.42	525	384790.7	168812.0	1.34	0.33	0.02	0.03	0.00101
G5	P1	1,000	4.95	0.25	33.42	525	384783.6	168806.3	1.34	0.33	0.02	0.03	0.00101
G6	P1	1,000	4.95	0.25	33.42	525	384780.0	168804.4	1.34	0.33	0.02	0.03	0.00101
G7	P1	1,000	4.95	0.25	33.42	525	384776.3	168802.8	1.34	0.33	0.02	0.03	0.00101

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
G9	P1	1,000	4.95	0.25	33.42	525	384768.1	168799.0	1.34	0.33	0.02	0.03	0.00101
G10	P1	1,000	4.95	0.25	33.42	525	384764.4	168797.2	1.34	0.33	0.02	0.03	0.00101
G11	P1	1,000	4.95	0.25	33.42	525	384760.8	168795.6	1.34	0.33	0.02	0.03	0.00101
G12	P1	1,000	4.95	0.25	33.42	525	384757.0	168793.8	1.34	0.33	0.02	0.03	0.00101
1	P2	1,464	5.26	0.40	44.56	495	384869.9	168831.1	2.30	0.41	0.04	0.05	0.00139
2	P2	1,464	5.26	0.40	44.56	495	384868.1	168835.0	2.30	0.41	0.04	0.05	0.00139
4	P2	1,464	5.26	0.40	44.56	495	384864.5	168842.8	2.30	0.41	0.04	0.05	0.00139
5	P2	1,464	5.26	0.40	44.56	495	384862.6	168847.0	2.30	0.41	0.04	0.05	0.00139
7	P2	1,464	5.26	0.40	44.56	495	384858.8	168854.9	2.30	0.41	0.04	0.05	0.00139
8	P2	1,464	5.26	0.40	44.56	495	384857.2	168858.8	2.30	0.41	0.04	0.05	0.00139
10	P2	1,464	5.26	0.40	44.56	495	384852.1	168869.4	2.30	0.41	0.04	0.05	0.00139
11	P2	1,464	5.26	0.40	44.56	495	384850.4	168873.4	2.30	0.41	0.04	0.05	0.00139
13	P2	1,464	5.26	0.40	44.56	495	384846.7	168881.5	2.30	0.41	0.04	0.05	0.00139
14	P2	1,464	5.26	0.40	44.56	495	384845.0	168885.2	2.30	0.41	0.04	0.05	0.00139
16	P2	1,464	5.26	0.40	44.56	495	384841.3	168893.1	2.30	0.41	0.04	0.05	0.00139

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
17	P2	1,464	5.26	0.40	44.56	495	384839.4	168897.0	2.30	0.41	0.04	0.05	0.00139
HV1-1	P4	2,040	5.62	0.35	37.94	505	384962.2	168840.5	2.09	0.23	0.01	0.06	0.00068
HV1-2	P4	2,040	5.62	0.35	37.94	505	384962.8	168839.0	2.09	0.23	0.01	0.06	0.00068
HV2-1	P4	2,040	5.62	0.35	37.94	505	384963.7	168837.1	2.09	0.23	0.01	0.06	0.00068
HV2-2	P4	2,040	5.62	0.35	37.94	505	384964.4	168835.7	2.09	0.23	0.01	0.06	0.00068
HV3-1	P4	2,040	5.62	0.35	37.94	505	384965.7	168832.8	2.09	0.23	0.01	0.06	0.00068
HV3-2	P4	2,040	5.62	0.35	37.94	505	384966.4	168831.3	2.09	0.23	0.01	0.06	0.00068
HV4-1	P4	2,040	5.62	0.35	37.94	505	384967.3	168829.5	2.09	0.23	0.01	0.06	0.00068
HV4-2	P4	2,040	5.62	0.35	37.94	505	384967.8	168828.1	2.09	0.23	0.01	0.06	0.00068
HV5-1	P4	2,040	5.62	0.35	37.94	505	384969.2	168825.2	2.09	0.23	0.01	0.06	0.00068
HV5-2	P4	2,040	5.62	0.35	37.94	505	384969.8	168824.0	2.09	0.23	0.01	0.06	0.00068
HV6-1	P4	2,040	5.62	0.35	37.94	505	384970.8	168821.9	2.09	0.23	0.01	0.06	0.00068
HV6-2	P4	2,040	5.62	0.35	37.94	505	384971.1	168820.9	2.09	0.23	0.01	0.06	0.00068
HV7-1	P4	2,040	5.62	0.35	37.94	505	384972.7	168817.7	2.09	0.23	0.01	0.06	0.00068
HV7-2	P4	2,040	5.62	0.35	37.94	505	384973.2	168816.6	2.09	0.23	0.01	0.06	0.00068

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
HV8-1	P4	2,040	5.62	0.35	37.94	505	384974.2	168814.4	2.09	0.23	0.01	0.06	0.00068
HV8-2	P4	2,040	5.62	0.35	37.94	505	384974.8	168813.1	2.09	0.23	0.01	0.06	0.00068
HV9-1	P4	2,040	5.62	0.35	37.94	505	384976.2	168810.1	2.09	0.23	0.01	0.06	0.00068
HV9-2	P4	2,040	5.62	0.35	37.94	505	384976.8	168808.8	2.09	0.23	0.01	0.06	0.00068
HV10-1	P4	2,040	5.62	0.35	37.94	505	384977.7	168806.9	2.09	0.23	0.01	0.06	0.00068
HV10-2	P4	2,040	5.62	0.35	37.94	505	384978.3	168805.6	2.09	0.23	0.01	0.06	0.00068
HV11-1	P4	2,040	5.62	0.35	34.30	490	384979.7	168802.8	1.83	0.16	0.01	0.04	0.00064
HV11-2	P4	2,040	5.62	0.35	34.30	490	384980.3	168801.4	1.83	0.16	0.01	0.04	0.00064
HV12-1	P4	2,040	5.62	0.35	34.30	490	384981.2	168799.5	1.83	0.16	0.01	0.04	0.00064
HV12-2	P4	2,040	5.62	0.35	34.30	490	384981.7	168798.2	1.83	0.16	0.01	0.04	0.00064
HV13-1	P4	2,040	5.62	0.35	34.30	490	384983.2	168795.1	1.83	0.16	0.01	0.04	0.00064
HV13-2	P4	2,040	5.62	0.35	34.30	490	384983.7	168793.9	1.83	0.16	0.01	0.04	0.00064
HV14-1	P4	2,040	5.62	0.35	34.30	490	384984.7	168791.8	1.83	0.16	0.01	0.04	0.00064
HV14-2	P4	2,040	5.62	0.35	34.30	490	384985.2	168790.6	1.83	0.16	0.01	0.04	0.00064
HV15-1	P4	2,040	5.62	0.35	34.30	490	384986.7	168787.6	1.83	0.16	0.01	0.04	0.00064

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
HV15-2	P4	2,040	5.62	0.35	34.30	490	384987.3	168786.4	1.83	0.16	0.01	0.04	0.00064
HV16-1	P4	2,040	5.62	0.35	34.30	490	384988.2	168784.3	1.83	0.16	0.01	0.04	0.00064
HV16-2	P4	2,040	5.62	0.35	34.30	490	384988.8	168783.1	1.83	0.16	0.01	0.04	0.00064
HV17-1	P4	2,040	5.62	0.35	34.30	490	384990.3	168780.0	1.83	0.16	0.01	0.04	0.00064
HV17-2	P4	2,040	5.62	0.35	34.30	490	384990.8	168778.9	1.83	0.16	0.01	0.04	0.00064
HV18-1	P4	2,040	5.62	0.35	34.30	490	384991.7	168776.9	1.83	0.16	0.01	0.04	0.00064
HV18-2	P4	2,040	5.62	0.35	34.30	490	384992.3	168775.6	1.83	0.16	0.01	0.04	0.00064
HV19-1	P4	2,040	5.62	0.35	34.30	490	385023.3	168785.3	3.19	0.16	0.01	0.04	0.00064
HV19-2	P4	2,040	5.62	0.35	34.30	490	385022.8	168786.3	3.19	0.16	0.01	0.04	0.00064
HV20-1	P4	2,040	5.62	0.35	34.30	490	385021.7	168788.8	3.19	0.16	0.01	0.04	0.00064
HV20-2	P4	2,040	5.62	0.35	34.30	490	385021.2	168789.8	3.19	0.16	0.01	0.04	0.00064
HV21-1	P4	2,040	5.62	0.35	34.30	490	385019.8	168792.8	3.19	0.16	0.01	0.04	0.00064
HV21-2	P4	2,040	5.62	0.35	34.30	490	385019.2	168794.1	3.19	0.16	0.01	0.04	0.00064
HV22-1	P4	2,040	5.62	0.35	34.30	490	385018.3	168796.2	3.19	0.16	0.01	0.04	0.00064
HV22-2	P4	2,040	5.62	0.35	34.30	490	385017.8	168797.1	3.19	0.16	0.01	0.04	0.00064

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Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
HV23-1	P4	2,040	5.62	0.35	34.30	490	385016.2	168800.7	3.19	0.16	0.01	0.04	0.00064
HV23-2	P4	2,040	5.62	0.35	34.30	490	385015.8	168801.4	3.19	0.16	0.01	0.04	0.00064
HV24-1	P4	2,040	5.62	0.35	34.30	490	385014.7	168803.8	3.19	0.16	0.01	0.04	0.00064
HV24-2	P4	2,040	5.62	0.35	34.30	490	385014.2	168804.7	3.19	0.16	0.01	0.04	0.00064
Gen 1	SQ19	2,196	10.00	0.50	37.18	505	384459.1	168814.2	4.18	0.46	0.02	0.12	0.00136
Gen 2	SQ19	2,196	10.00	0.50	37.18	505	384462.2	168812.7	4.18	0.46	0.02	0.12	0.00136
Gen 3	SQ19	2,196	10.00	0.50	37.18	505	384466.6	168810.6	4.18	0.46	0.02	0.12	0.00136
Gen 4	SQ19	2,196	10.00	0.50	37.18	505	384469.8	168809.1	4.18	0.46	0.02	0.12	0.00136
Gen 5	SQ19	2,196	10.00	0.50	37.18	505	384474.2	168807.1	4.18	0.46	0.02	0.12	0.00136
Gen 6	SQ19	2,196	10.00	0.50	37.18	505	384477.4	168805.5	4.18	0.46	0.02	0.12	0.00136
Gen 7	SQ19	2,196	10.00	0.50	37.18	505	384481.8	168803.4	4.18	0.46	0.02	0.12	0.00136
Gen 8	SQ19	2,196	10.00	0.50	37.18	505	384485.1	168801.9	4.18	0.46	0.02	0.12	0.00136
Gen 9	SQ19	2,196	10.00	0.50	37.18	505	384478.8	168845.5	4.18	0.46	0.02	0.12	0.00136
Gen 10	SQ19	2,196	10.00	0.50	37.18	505	384482.1	168844.1	4.18	0.46	0.02	0.12	0.00136
Gen 11	SQ19	2,196	10.00	0.50	37.18	505	384486.4	168841.9	4.18	0.46	0.02	0.12	0.00136

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
Gen 12	SQ19	2,196	10.00	0.50	37.18	505	384489.6	168840.4	4.18	0.46	0.02	0.12	0.00136
Gen 13	SQ19	2,196	10.00	0.50	37.18	505	384494.1	168838.3	4.18	0.46	0.02	0.12	0.00136
Gen 14	SQ19	2,196	10.00	0.50	37.18	505	384497.2	168836.8	4.18	0.46	0.02	0.12	0.00136
Gen 15	SQ19	2,196	10.00	0.50	37.18	505	384501.6	168834.8	4.18	0.46	0.02	0.12	0.00136
Gen 16	SQ19	2,196	10.00	0.50	37.18	505	384504.8	168833.3	4.18	0.46	0.02	0.12	0.00136

Table 16 Source Parameters - Event 3

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
GS1	SQ17-1	1,600	4.52	0.40	26.16	397	384544.0	168839.0	0.80	0.03	0.02	0.09	0.00033
GS2	SQ17-1	1,600	4.52	0.40	26.16	397	384548.0	168838.0	0.80	0.03	0.02	0.09	0.00033
GS3	SQ17-1	1,520	4.52	0.40	40.98	539	384589.0	168827.0	6.58	0.97	0.19	0.17	0.00121
GS4	SQ17-1	1,520	4.52	0.40	0.00	0	384592.0	168827.0	0.00	0.00	0.00	0.00	0.00000
GS5	SQ17-1	1,520	4.52	0.40	40.98	539	384596.0	168826.0	6.58	0.97	0.19	0.17	0.00121
GS6	SQ17-1	1,760	5.88	0.52	37.49	524	384574.4	168893.0	5.38	1.75	0.13	0.40	0.00121

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
GS7	SQ17-1	1,760	5.88	0.52	0.00	0	384575.5	168897.4	0.00	0.00	0.00	0.00	0.00000
GS8	SQ17-1	1,760	5.88	0.52	37.49	524	384576.7	168901.9	5.38	1.75	0.13	0.40	0.00121
G1	P1	1,000	4.95	0.40	18.64	442	384798.5	168815.7	1.02	0.15	0.02	0.05	0.00059
G2	P1	1,000	4.95	0.40	18.64	442	384794.6	168813.9	1.02	0.15	0.02	0.05	0.00059
G3	P1	1,000	4.95	0.40	18.64	442	384790.7	168812.0	1.02	0.15	0.02	0.05	0.00059
G5	P1	1,000	4.95	0.40	18.64	442	384783.6	168806.3	1.02	0.15	0.02	0.05	0.00059
G6	P1	1,000	4.95	0.40	18.64	442	384780.0	168804.4	1.02	0.15	0.02	0.05	0.00059
G7	P1	1,000	4.95	0.40	18.64	442	384776.3	168802.8	1.02	0.15	0.02	0.05	0.00059
G9	P1	1,000	4.95	0.40	26.48	479	384768.1	168799.0	1.00	0.13	0.02	0.04	0.00059
G10	P1	1,000	4.95	0.40	26.48	479	384764.4	168797.2	1.00	0.13	0.02	0.04	0.00059
G11	P1	1,000	4.95	0.40	26.48	479	384760.8	168795.6	1.00	0.13	0.02	0.04	0.00059
G12	P1	1,000	4.95	0.40	26.48	479	384757.0	168793.8	1.00	0.13	0.02	0.04	0.00059
1	P2	1,464	5.26	0.40	25.80	387	384869.9	168831.1	1.27	0.25	0.03	0.05	0.00057
2	P2	1,464	5.26	0.40	25.80	387	384868.1	168835.0	1.27	0.25	0.03	0.05	0.00057
4	P2	1,464	5.26	0.40	25.80	387	384864.5	168842.8	1.27	0.25	0.03	0.05	0.00057

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
5	P2	1,464	5.26	0.40	25.80	387	384862.6	168847.0	1.27	0.25	0.03	0.05	0.00057
7	P2	1,464	5.26	0.40	25.80	387	384858.8	168854.9	1.27	0.25	0.03	0.05	0.00057
8	P2	1,464	5.26	0.40	25.80	387	384857.2	168858.8	1.27	0.25	0.03	0.05	0.00057
10	P2	1,464	5.26	0.40	25.80	387	384852.1	168869.4	1.27	0.25	0.03	0.05	0.00057
11	P2	1,464	5.26	0.40	25.80	387	384850.4	168873.4	1.27	0.25	0.03	0.05	0.00057
13	P2	1,464	5.26	0.40	25.80	387	384846.7	168881.5	1.27	0.25	0.03	0.05	0.00057
14	P2	1,464	5.26	0.40	25.80	387	384845.0	168885.2	1.27	0.25	0.03	0.05	0.00057
16	P2	1,464	5.26	0.40	25.80	387	384841.3	168893.1	1.27	0.25	0.03	0.05	0.00057
17	P2	1,464	5.26	0.40	25.80	387	384839.4	168897.0	1.27	0.25	0.03	0.05	0.00057
HV1-1	P4	2,040	5.62	0.35	21.20	447	384962.2	168840.5	0.79	0.12	0.02	0.03	0.00034
HV1-2	P4	2,040	5.62	0.35	21.20	447	384962.8	168839.0	0.79	0.12	0.02	0.03	0.00034
HV2-1	P4	2,040	5.62	0.35	21.20	447	384963.7	168837.1	0.79	0.12	0.02	0.03	0.00034
HV2-2	P4	2,040	5.62	0.35	21.20	447	384964.4	168835.7	0.79	0.12	0.02	0.03	0.00034
HV3-1	P4	2,040	5.62	0.35	21.20	447	384965.7	168832.8	0.79	0.12	0.02	0.03	0.00034
HV3-2	P4	2,040	5.62	0.35	21.20	447	384966.4	168831.3	0.79	0.12	0.02	0.03	0.00034

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
HV4-1	P4	2,040	5.62	0.35	21.20	447	384967.3	168829.5	0.79	0.12	0.02	0.03	0.00034
HV4-2	P4	2,040	5.62	0.35	21.20	447	384967.8	168828.1	0.79	0.12	0.02	0.03	0.00034
HV5-1	P4	2,040	5.62	0.35	21.20	447	384969.2	168825.2	0.79	0.12	0.02	0.03	0.00034
HV5-2	P4	2,040	5.62	0.35	21.20	447	384969.8	168824.0	0.79	0.12	0.02	0.03	0.00034
HV6-1	P4	2,040	5.62	0.35	21.20	447	384970.8	168821.9	0.79	0.12	0.02	0.03	0.00034
HV6-2	P4	2,040	5.62	0.35	21.20	447	384971.1	168820.9	0.79	0.12	0.02	0.03	0.00034
HV7-1	P4	2,040	5.62	0.35	21.20	447	384972.7	168817.7	0.79	0.12	0.02	0.03	0.00034
HV7-2	P4	2,040	5.62	0.35	21.20	447	384973.2	168816.6	0.79	0.12	0.02	0.03	0.00034
HV8-1	P4	2,040	5.62	0.35	21.20	447	384974.2	168814.4	0.79	0.12	0.02	0.03	0.00034
HV8-2	P4	2,040	5.62	0.35	21.20	447	384974.8	168813.1	0.79	0.12	0.02	0.03	0.00034
HV9-1	P4	2,040	5.62	0.35	21.20	447	384976.2	168810.1	0.79	0.12	0.02	0.03	0.00034
HV9-2	P4	2,040	5.62	0.35	21.20	447	384976.8	168808.8	0.79	0.12	0.02	0.03	0.00034
HV10-1	P4	2,040	5.62	0.35	21.20	447	384977.7	168806.9	0.79	0.12	0.02	0.03	0.00034
HV10-2	P4	2,040	5.62	0.35	21.20	447	384978.3	168805.6	0.79	0.12	0.02	0.03	0.00034
HV11-1	P4	2,040	5.62	0.35	19.59	420	384979.7	168802.8	1.05	0.09	0.01	0.04	0.00037

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
HV11-2	P4	2,040	5.62	0.35	19.59	420	384980.3	168801.4	1.05	0.09	0.01	0.04	0.00037
HV12-1	P4	2,040	5.62	0.35	19.59	420	384981.2	168799.5	1.05	0.09	0.01	0.04	0.00037
HV12-2	P4	2,040	5.62	0.35	19.59	420	384981.7	168798.2	1.05	0.09	0.01	0.04	0.00037
HV13-1	P4	2,040	5.62	0.35	19.59	420	384983.2	168795.1	1.05	0.09	0.01	0.04	0.00037
HV13-2	P4	2,040	5.62	0.35	19.59	420	384983.7	168793.9	1.05	0.09	0.01	0.04	0.00037
HV14-1	P4	2,040	5.62	0.35	19.59	420	384984.7	168791.8	1.05	0.09	0.01	0.04	0.00037
HV14-2	P4	2,040	5.62	0.35	19.59	420	384985.2	168790.6	1.05	0.09	0.01	0.04	0.00037
HV15-1	P4	2,040	5.62	0.35	19.59	420	384986.7	168787.6	1.05	0.09	0.01	0.04	0.00037
HV15-2	P4	2,040	5.62	0.35	19.59	420	384987.3	168786.4	1.05	0.09	0.01	0.04	0.00037
HV16-1	P4	2,040	5.62	0.35	19.59	420	384988.2	168784.3	1.05	0.09	0.01	0.04	0.00037
HV16-2	P4	2,040	5.62	0.35	19.59	420	384988.8	168783.1	1.05	0.09	0.01	0.04	0.00037
HV17-1	P4	2,040	5.62	0.35	19.59	420	384990.3	168780.0	1.05	0.09	0.01	0.04	0.00037
HV17-2	P4	2,040	5.62	0.35	19.59	420	384990.8	168778.9	1.05	0.09	0.01	0.04	0.00037
HV18-1	P4	2,040	5.62	0.35	19.59	420	384991.7	168776.9	1.05	0.09	0.01	0.04	0.00037
HV18-2	P4	2,040	5.62	0.35	19.59	420	384992.3	168775.6	1.05	0.09	0.01	0.04	0.00037

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
HV19-1	P4	2,040	5.62	0.35	19.59	465	385023.3	168785.3	1.66	0.08	0.01	0.03	0.00034
HV19-2	P4	2,040	5.62	0.35	19.59	465	385022.8	168786.3	1.66	0.08	0.01	0.03	0.00034
HV20-1	P4	2,040	5.62	0.35	19.59	465	385021.7	168788.8	1.66	0.08	0.01	0.03	0.00034
HV20-2	P4	2,040	5.62	0.35	19.59	465	385021.2	168789.8	1.66	0.08	0.01	0.03	0.00034
HV21-1	P4	2,040	5.62	0.35	19.59	465	385019.8	168792.8	1.66	0.08	0.01	0.03	0.00034
HV21-2	P4	2,040	5.62	0.35	19.59	465	385019.2	168794.1	1.66	0.08	0.01	0.03	0.00034
HV22-1	P4	2,040	5.62	0.35	19.59	465	385018.3	168796.2	1.66	0.08	0.01	0.03	0.00034
HV22-2	P4	2,040	5.62	0.35	19.59	465	385017.8	168797.1	1.66	0.08	0.01	0.03	0.00034
HV23-1	P4	2,040	5.62	0.35	19.59	465	385016.2	168800.7	1.66	0.08	0.01	0.03	0.00034
HV23-2	P4	2,040	5.62	0.35	19.59	465	385015.8	168801.4	1.66	0.08	0.01	0.03	0.00034
HV24-1	P4	2,040	5.62	0.35	19.59	465	385014.7	168803.8	1.66	0.08	0.01	0.03	0.00034
HV24-2	P4	2,040	5.62	0.35	19.59	465	385014.2	168804.7	1.66	0.08	0.01	0.03	0.00034
Gen 1	SQ19	2,196	10.00	0.50	0.00	0	384459.1	168814.2	0.00	0.00	0.00	0.00	0.0000
Gen 2	SQ19	2,196	10.00	0.50	0.00	0	384462.2	168812.7	0.00	0.00	0.00	0.00	0.0000
Gen 3	SQ19	2,196	10.00	0.50	37.18	505	384466.6	168810.6	4.18	0.46	0.02	0.12	0.00136

Generator	Building	Rating (kW)	Stack Height (m)	Stack Diameter (m)	Efflux Velocity (m/s)	Exhaust Gas Temp. (°C)	Stack Location (NGR) (m)		Pollutant Emission Rate (g/s)				
							X	Y	NO_x	CO	PM	CH_2O	SO_2
Gen 4	SQ19	2,196	10.00	0.50	37.18	505	384469.8	168809.1	4.18	0.46	0.02	0.12	0.00136
Gen 5	SQ19	2,196	10.00	0.50	37.18	505	384474.2	168807.1	4.18	0.46	0.02	0.12	0.00136
Gen 6	SQ19	2,196	10.00	0.50	37.18	505	384477.4	168805.5	4.18	0.46	0.02	0.12	0.00136
Gen 7	SQ19	2,196	10.00	0.50	37.18	505	384481.8	168803.4	4.18	0.46	0.02	0.12	0.00136
Gen 8	SQ19	2,196	10.00	0.50	37.18	505	384485.1	168801.9	4.18	0.46	0.02	0.12	0.00136
Gen 9	SQ19	2,196	10.00	0.50	37.18	505	384478.8	168845.5	4.18	0.46	0.02	0.12	0.00136
Gen 10	SQ19	2,196	10.00	0.50	37.18	505	384482.1	168844.1	4.18	0.46	0.02	0.12	0.00136
Gen 11	SQ19	2,196	10.00	0.50	37.18	505	384486.4	168841.9	4.18	0.46	0.02	0.12	0.00136
Gen 12	SQ19	2,196	10.00	0.50	37.18	505	384489.6	168840.4	4.18	0.46	0.02	0.12	0.00136
Gen 13	SQ19	2,196	10.00	0.50	37.18	505	384494.1	168838.3	4.18	0.46	0.02	0.12	0.00136
Gen 14	SQ19	2,196	10.00	0.50	37.18	505	384497.2	168836.8	4.18	0.46	0.02	0.12	0.00136
Gen 15	SQ19	2,196	10.00	0.50	37.18	505	384501.6	168834.8	4.18	0.46	0.02	0.12	0.00136
Gen 16	SQ19	2,196	10.00	0.50	37.18	505	384504.8	168833.3	4.18	0.46	0.02	0.12	0.00136

4.4.2 The emission rate for PM is stated as total dust. However, for the purposes of dispersion modelling it was considered that the entire PM emission consisted of only PM_{10} or $PM_{2.5}$. This allowed the maximum ground level impacts, with respect to the relevant EQSs, to be assessed. Actual plant emissions of PM are unlikely to only consist of only these size fractions, resulting in a worst-case assessment.

4.4.3 Reference should be made to Figure 4 for a map of the source locations.

4.5 NO_x to NO_2 Conversion

4.5.1 Ambient NO_x concentrations were predicted through dispersion modelling. Concentrations of NO_2 shown in the results section assume 15% conversion from NO_x to NO_2, based upon the approach adopted for the original Air Quality Detailed Modelling Assessment[16] which was accepted by the EA.

4.6 Building Effects

4.6.1 The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures can interrupt the wind flows and cause significantly higher ground-level concentrations close to the source than would arise in the absence of the buildings.

4.6.2 Analysis of the site layout indicated that a number of structures should be included within the model in order to take account of effects on pollutant dispersion. Building input geometries are shown in Table 17.

Table 17 Building Geometries

Building	NGR (m)		Height (m)	Length / Diameter (m)	Width (m)	Angle (°)
	X	Y				
SQ17-1	384585.7	168864.6	11.7	36.0	86.7	194.2
SQ17-2	384605.8	168887.2	11.7	17.3	40.3	194.2
P1	384760.0	168844.9	11.7	72.6	49.7	155.0

16 Spring Park, Corsham SN13 9GB Air Quality Detailed Modelling Assessment, Waterman Infrastructure & Environment Limited, 2019.

Building	NGR (m)		Height (m)	Length / Diameter (m)	Width (m)	Angle (°)
	X	Y				
P2	384903.3	168885.6	11.7	77.0	81.9	155.0
P4	384922.0	168779.7	0.0	80.1	96.9	155.0
SQ19 HV Gen Switch Room	384495.8	168801.8	5.9	9.0	18.8	115.1
SQ18	384557.0	168762.7	10.0	30.8	15.4	134.6

4.7 Meteorological Data

4.7.1 Meteorological data used in the assessment was taken from Lyneham meteorological station over the period 1st January 2017 to 31st December 2021 (inclusive). This observation station is located at NGR: 401484, 177895, which is approximately 18.3km north-east of the facility. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

4.7.2 All meteorological files used in the assessment were provided by Atmospheric Dispersion Modelling Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 5 for wind roses of the utilised meteorological records.

4.8 Roughness Length

4.8.1 A roughness length (z_0) of 0.3m was used to describe the modelling extents and meteorological site. This value of z_0 is considered appropriate for the morphology of both areas and is suggested within ADMS-5 as being suitable for 'agricultural areas (max)'.

4.9 Monin-Obukhov Length

4.9.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 10m was used to describe the modelling extents and meteorological site. This value is considered appropriate for the nature of both areas and is suggested within ADMS-5 as being suitable for 'small towns <50,000'.

4.10 Terrain Data

4.10.1 Inclusion of terrain data is recommended within the ADMS-5 user guide[17] if the gradient within a modelling area varies by more than 10% (1 in 10). Analysis of changes in elevation throughout the assessment extents using Google Earth indicated the surrounding topography is reasonably flat. As such, terrain data was not included within the model.

4.11 Background Concentrations

4.11.1 Review of the data summarised in Section 3.0 was undertaken in order to identify suitable baseline values for use in the assessment. This indicated the closest monitor is positioned a significant distance from the installation. As such, results are considered unlikely to be representative of the facility location. The background concentrations predicted by DEFRA were therefore utilised to represent baseline levels in the vicinity of the site.

4.11.2 Background levels at the ecological receptors were obtained from the APIS website, as summarised in Section 3.5.

4.11.3 It is not possible to add short-term peak baseline and process concentrations. This is because the conditions which give rise to peak ground-level concentrations of substances emitted from an elevated source at a particular location and time are likely to be different to the conditions which give rise to peak concentrations due to emissions from other sources. This point is addressed in in EA guidance 'Air emissions risk assessment for your environmental permit'[18], which advises that an estimate of the maximum combined pollutant concentration can be obtained by adding the maximum predicted short-term concentration due to emissions from the source to twice the annual mean baseline concentration. This approach was adopted throughout the assessment.

4.12 Modelling Uncertainty

4.12.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

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17 ADMS-5 User Guide, CERC, 2016.

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

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and,
- Variability - randomness of measurements used.

4.12.2 Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

- Choice of model - ADMS-5 is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Meteorological data - Modelling was undertaken using five annual meteorological data sets from an observation station local to the site to account for inter-year variability. The assessment was based on the worst-case year to ensure maximum concentrations were considered;
- Surface characteristics - The z_0 and Monin-Obukhov length were determined for both the dispersion and meteorological sites based on the surrounding land uses and guidance provided by CERC;
- Plant operating conditions - Operational parameters were provided by the applicant and were partly utilised in the previous Air Quality Assessment[19] which was accepted by the EA, or were obtained from the relevant technical data sheets for the engines. As such, input parameters are considered to be representative of the relevant operating conditions;
- Background concentrations - Background pollutant levels were obtained from the DEFRA mapping study and APIS website;
- Receptor locations - Sensitive human and ecological locations were obtained from the previous Air Quality Assessment. These were verified through review of mapping resources; and,
- Variability - All model inputs were as accurate as possible and worst-case conditions were considered as necessary in order to ensure a robust assessment of potential pollutant concentrations.

[19] Air Quality Assessment, Spring Park Data Centre, Corsham, Environmental Permit: EPR/PP3003PW, Redmore Environmental Ltd, 2021.

4.12.3 Results were considered in the context of the relevant EQSs. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

5.0 RESULTS

5.1 Introduction

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 4.0. The results are outlined in the following Sections.

5.2 Event 1

5.2.1 The maximum PEC for any meteorological data set at each receptor during Event 1 is summarised in Table 18.

Table 18 Event 1: Predicted Pollutant Concentrations

Receptor	PEC (µg/m³)							
	NO_2		CH_2O		CO		SO_2	
	10-Minutes	30-Minutes	10-Minutes	30-Minutes	10-Minutes	30-Minutes	10-Minutes	30-Minutes
R1	1,146	1,008	152	133	1,074	999	6	6
R2	621	465	88	66	814	726	5	5
R3	735	527	99	71	862	749	6	5
R4	760	549	100	72	867	754	6	5
R5	1,057	841	146	115	1,049	927	6	6
R6	949	730	134	102	997	871	6	6
R7	587	489	87	71	812	746	5	5
R8	575	517	88	78	910	829	6	5

5.2.2 As shown in Table 18, there were no predicted exceedences of any EQS at any receptor location for any pollutant or averaging period of interest, with the exception of 10-minute NO_2 concentrations at receptors R1, R5 and R6 and 30-minute NO_2 concentrations at receptor R1.

5.2.3 Further analysis of the modelling results was undertaken in order to identify the cause of the predicted 10-minute EQS exceedences. This indicated that the maximum concentration, which was modelled at R1, was predicted using 2019 meteorological data. The results for each generator set using these records are summarised in Table 19.

Table 19 Event 1: Predicted 10-minute Mean NO_2 Concentrations using 2019 Meteorological Data

Receptor	10-minute Mean NO_2 PEC (μg/m³)				
	HV Gen Farm	P1	P2	SQ17	SQ19
R1	1,134	132	128	118	129
R2	535	143	182	238	120
R3	467	131	99	169	177
R4	688	95	135	160	278
R5	971	132	149	105	118
R6	926	107	137	107	114
R7	511	193	133	209	154
R8	563	274	119	291	155

5.2.4 As shown in Table 19, there were no predicted exceedences of the relevant EQS as a result of P1, P2, SQ17 or SQ19 generator testing.

5.2.5 As outlined previously, the results shown in Table 18 and Table 19 assume constant operation of the HV Gen Farm generator bank throughout the year. This has therefore presented an extreme worst-case scenario of the standby test coinciding with the worst-case meteorological conditions. Given the tests are only undertaken over a period of 15-minutes three times per annum, this is very unlikely to occur and can be avoided through timing of the event during periods of appropriate weather. A suitable procedure can be secured as part of the Air Quality Management Plan for the site. As such, impacts during Event 1 are not considered to be significant, subject to control of timing of HV Gen Farm testing.

5.3 Event 2

5.3.1 The maximum PEC for any meteorological data set at each receptor during Event 2 is summarised in Table 20.

Table 20 Event 2: Predicted Pollutant Concentrations

Receptor	Maximum Predicted 1-hour Mean PEC (µg/m³)			
	NO_2	CH_2O	CO	SO_2
R1	76.80	8.49	499	4.35
R2	39.51	10.16	510	4.27
R3	37.04	11.11	514	4.28
R4	40.97	12.85	505	4.30
R5	52.89	5.62	490	4.32
R6	45.97	5.36	489	4.30
R7	44.25	11.05	514	4.33
R8	67.26	12.79	522	4.33

5.3.2 As shown in Table 20, there were no predicted exceedences of any EQS, including the relevant AEGLs and 1-hour mean AQOs for NO_2 and SO_2, at any location for any pollutant or averaging period of interest.

5.3.3 As outlined previously, the results shown in Table 20 assume constant operation of each generator throughout the year. This has therefore presented an extreme worst-case scenario of the test coinciding with the worst-case meteorological conditions. Given the tests are only undertaken over a period of 2-hours once per annum, this is very unlikely to occur. As such, as EQS exceedences were not predicted, impacts during Event 2 are not considered to be significant.

5.4 Event 3

Human Receptors

5.4.1 The maximum PEC for any meteorological data set at each human receptor during Event 3 is summarised in Table 21.

Table 21 Event 3: Predicted Pollutant Concentrations at Human Receptors

Receptor	PEC (µg/m³)				
	NO_2		Maximum 1-hour Mean CH_2O	Maximum 8-hour Rolling Mean CO	Maximum 1-hour Mean SO_2
	83.68th %ile 1-hour Mean	Maximum 1-hour Mean			
R1	203.26	682.90	146.56	764.80	6.88
R2	42.55	314.88	69.14	572.43	5.49
R3	11.93	418.00	92.16	626.79	6.08
R4	44.43	396.22	84.92	714.14	5.75
R5	65.19	563.54	126.04	693.25	6.76
R6	15.72	459.47	102.38	655.99	6.23
R7	104.58	336.37	72.79	626.71	5.64
R8	89.45	317.32	67.57	621.41	5.59

5.4.2 The results shown in Table 21 can be summarised as follows:

- The 83.68th %ile 1-hour mean NO_2 concentration is predicted to slightly exceed the AQO at one receptor (R1);
- The maximum 1-hour mean NO_2 concentration is not predicted to exceed the AEGL at any receptor;
- The maximum 1-hour mean CH_2O concentration is predicted to exceed the EAL at three receptors;
- The maximum 8-hour rolling mean CO concentration is not predicted to exceed the AQO at any receptor; and,
- The maximum 1-hour mean SO_2 concentration is not predicted to exceed the AQO or AEGL at any receptor.

5.4.3 As exceedences of the relevant EQSs for CO and SO_2 were not predicted, impacts associated with these emissions during Event 3 are not considered to be significant.

5.4.4 Predicted NO_2 concentrations exceeded the AQO at one receptor. However, they were below the AEGL at all locations. As such, notable discomfort, irritation, or certain asymptomatic non-sensory effects are not likely. As outlined previously, the results shown in Table 21 assume constant operation of all generators throughout the year. This has therefore presented an extreme worst-case scenario of a grid outage coinciding with the worst-case meteorological conditions. Given the maximum grid outage is anticipated to be 72-hours and the maximum period a bank of generators has been used in an emergency over the last 10-years is 4-hours, there have been no instances where all the generators have started simultaneously, this is very unlikely to occur. As such, impacts associated with NO_2 and CH_2O emissions during Event 3 are not considered to be significant.

Ecological Receptors

5.4.5 The potential for exceedences of the 24-hour mean EQS at ecological receptors during Event 3 was assessed using the methodology outlined in Section 4.3. The number of threshold exceedences, representing the number of days within a year where the 24-hour NO_x EQS would be exceeded based on 24-hour operation, 365-days per year, was initially modelled. These are summarised in Table 22.

Table 22 24-hour Mean NO_x Threshold Exceedences

Receptor		Number of Threshold Exceedences (Days)				
		2017	2018	2019	2020	2021
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	44	74	60	67	75
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	49	82	62	70	69
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	40	49	48	49	65
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	37	61	61	47	60
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	53	64	71	60	62
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	65	73	79	63	62
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	110	114	123	103	101
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	121	114	134	116	104

Receptor		Number of Threshold Exceedences (Days)				
		2017	2018	2019	2020	2021
E9	Corsham Railway Cutting SSSI	220	178	194	202	186
E10	By Brook LWS	14	19	26	21	15
E11	By Brook LWS	12	17	24	16	13
E12	By Brook LWS	11	16	24	14	16
E13	By Brook LWS	11	16	24	14	19
E14	By Brook LWS	11	14	22	14	24
E15	By Brook LWS	12	19	27	14	33
E16	By Brook LWS	14	19	28	9	33
E17	Hungerford Wood LWS	15	17	26	17	9
E18	Tilley's Wood LWS	15	14	27	20	9
E19	White Wood, Box LWS and AW	31	71	46	63	65
E20	Hazelbury Fields LWS	33	70	48	64	72
E21	Hazelbury Fields LWS	37	94	56	78	89
E22	Privett's Wood LWS and AW	40	85	58	82	82
E23	Hazelbury Common LWS	46	107	73	87	95
E24	Hazelbury Common LWS	41	97	65	80	91
E25	Kingsmoor Wood LWS and AW	124	166	125	143	160
E26	Botleaze Wood LWS	32	38	41	24	30
E27	Cottles Wood AW	37	31	35	21	32

5.4.6 As shown in Table 22, the 24-hour NO_x EQS is exceeded on a maximum of 220 days at any receptor location. This result was predicted at receptor E9.

5.4.7 The next step in the analysis involved determining the 'probability of exceedence' occurring by dividing the maximum number of exceedence days by the numbers of days in a year.

Table 23 Probability of 24-hour EQS Exceedence

Receptor		Maximum Number of Exceedence Days	Probability of Exceedence (%)
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	75	20.5
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	82	22.5
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	65	17.8
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	61	16.7
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	71	19.5
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	79	21.6
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	123	33.7
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	134	36.7
E9	Corsham Railway Cutting SSSI	220	60.3
E10	By Brook LWS	26	7.1
E11	By Brook LWS	24	6.6
E12	By Brook LWS	24	6.6
E13	By Brook LWS	24	6.6
E14	By Brook LWS	24	6.6
E15	By Brook LWS	33	9.0
E16	By Brook LWS	33	9.0
E17	Hungerford Wood LWS	26	7.1
E18	Tilley's Wood LWS	27	7.4
E19	White Wood, Box LWS and AW	71	19.5
E20	Hazelbury Fields LWS	72	19.7
E21	Hazelbury Fields LWS	94	25.8
E22	Privett's Wood LWS and AW	85	23.3
E23	Hazelbury Common LWS	107	29.3
E24	Hazelbury Common LWS	97	26.6

Receptor		Maximum Number of Exceedence Days	Probability of Exceedence (%)
E25	Kingsmoor Wood LWS and AW	166	45.5
E26	Botleaze Wood LWS	41	11.2
E27	Cottles Wood AW	37	10.1

5.4.8 As shown in Table 23, the highest probability of an exceedence of the EQS was 60.3% at receptor E9.

5.4.9 The 'probability of exceedence' shown in Table 23 assumes that the plant is operational 24-hours a day, 365-days a year. However, the duration of Event 3 is 72-hours. As such, the 'probability of operation' was calculated as 0.8% i.e 3-days in every 365.

5.4.10 The final step in the analysis involved combining the 'probability of operation' with the 'probability of exceedence' to give the 'probability of operational exceedence'. This value represented the probability that an EQS exceedence occurs within a given year should a 72-hour grid outage arise. The results are shown in Table 24.

Table 24 Probability of Operational Exceedence

Receptor		Probability of Exceedence (%)	Probability of Operation (%)	Probability of Operational Exceedence (%)
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	20.5	0.8	0.17
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	22.5	0.8	0.18
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	17.8	0.8	0.15
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	16.7	0.8	0.14
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	19.5	0.8	0.16
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	21.6	0.8	0.18

Receptor		Probability of Exceedence (%)	Probability of Operation (%)	Probability of Operational Exceedence (%)
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	33.7	0.8	0.28
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	36.7	0.8	0.30
E9	Corsham Railway Cutting SSSI	60.3	0.8	0.50
E10	By Brook LWS	7.1	0.8	0.06
E11	By Brook LWS	6.6	0.8	0.05
E12	By Brook LWS	6.6	0.8	0.05
E13	By Brook LWS	6.6	0.8	0.05
E14	By Brook LWS	6.6	0.8	0.05
E15	By Brook LWS	9.0	0.8	0.07
E16	By Brook LWS	9.0	0.8	0.07
E17	Hungerford Wood LWS	7.1	0.8	0.06
E18	Tilley's Wood LWS	7.4	0.8	0.06
E19	White Wood, Box LWS and AW	19.5	0.8	0.16
E20	Hazelbury Fields LWS	19.7	0.8	0.16
E21	Hazelbury Fields LWS	25.8	0.8	0.21
E22	Privett's Wood LWS and AW	23.3	0.8	0.19
E23	Hazelbury Common LWS	29.3	0.8	0.24
E24	Hazelbury Common LWS	26.6	0.8	0.22
E25	Kingsmoor Wood LWS and AW	45.5	0.8	0.37
E26	Botleaze Wood LWS	11.2	0.8	0.09
E27	Cottles Wood AW	10.1	0.8	0.08

5.4.11 As shown in Table 24, the maximum probability that the EQS will be exceeded should a 72-hour grid outage arise is 0.50% at receptor E9. The EA guidance 'dispersion modelling for oxides of nitrogen assessment for specified generators'[20] states that probabilities of less than 1% indicate exceedences are highly unlikely. As such, impacts at ecological receptors are not considered to be significant based on the maximum Event 3 duration.

5.5 Long Term Averaging Periods

Human Receptors

5.5.1 Maximum predicted annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations based on a total operational period of 76.75-hours per annum are summarised in Table 25.

Table 25 Predicted Long Term Pollutant Concentrations - Human Receptors

Receptor	PEC (µg/m³)		
	NO_2	PM_{10}	$PM_{2.5}$
R1	6.94	12.48	7.80
R2	6.05	12.44	7.75
R3	6.00	12.44	7.75
R4	6.19	12.45	7.75
R5	6.26	12.45	7.76
R6	6.06	12.44	7.75
R7	6.32	12.47	7.77
R8	6.27	12.45	7.76

5.5.2 As shown in Table 25, there were no predicted exceedences of any EQS at any receptor location for any pollutant or averaging period of interest.

5.5.3 As the predicted concentrations shown in Table 25 are based on the total theoretical operational period, impacts associated with Event 1, Event 2 or Event 3 in isolation would therefore be lower. As such, impacts on long term pollutant concentrations at human receptors are not considered to be significant.

20 Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators, EA, 2018.

5.5.4 Maximum predicted 90.4th %ile 24-hour mean PM_{10} concentrations based on continuous operation are summarised in Table 26.

Table 26 Predicted 24-hour PM_{10} Concentrations - Human Receptors

Receptor	90.4th %ile 24-hour Mean PM_{10} PEC (µg/m³)
R1	42.07
R2	29.81
R3	28.55
R4	35.56
R5	31.63
R6	29.20
R7	35.88
R8	34.06

5.5.5 As shown in Table 26, there were no predicted exceedences of the 24-hour mean EQS for PM_{10} at any receptor location.

5.5.6 As the predicted concentrations shown in Table 26 are based on constant operation of the entire facility, impacts associated with Event 1, Event 2 or Event 3 in isolation would therefore be lower. As such, impacts on 24-hour mean PM_{10} concentrations at human receptors are not considered to be significant.

Ecological Receptors

<u>Oxides of Nitrogen</u>

5.5.7 Maximum predicted annual mean NO_x concentrations at the ecological receptor locations based on a total operational period of 76.75-hours per annum are summarised in Table 27.

Table 27 Predicted Annual Mean NO_x Concentrations - Ecological Receptors

Receptor		Maximum Predicted Annual Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.36	15.81	1.2	52.7
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.40	15.85	1.3	52.8
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.29	15.74	1.0	52.5
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.36	15.81	1.2	52.7
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.42	15.87	1.4	52.9
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.53	15.98	1.8	53.3
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.97	16.42	3.2	54.7
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.83	16.28	2.8	54.3
E9	Corsham Railway Cutting SSSI	1.38	16.83	4.6	56.1
E10	By Brook LWS	0.11	15.56	0.4	51.9
E11	By Brook LWS	0.10	15.55	0.3	51.8
E12	By Brook LWS	0.10	15.55	0.3	51.8
E13	By Brook LWS	0.10	15.55	0.3	51.8
E14	By Brook LWS	0.10	15.55	0.3	51.8
E15	By Brook LWS	0.11	15.56	0.4	51.9
E16	By Brook LWS	0.12	15.57	0.4	51.9
E17	Hungerford Wood LWS	0.10	15.55	0.3	51.8
E18	Tilley's Wood LWS	0.10	15.55	0.3	51.8
E19	White Wood, Box LWS and AW	0.28	15.73	0.9	52.4
E20	Hazelbury Fields LWS	0.29	15.74	1.0	52.5

Receptor		Maximum Predicted Annual Mean NO_x Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E21	Hazelbury Fields LWS	0.39	15.84	1.3	52.8
E22	Privett's Wood LWS and AW	0.38	15.83	1.3	52.8
E23	Hazelbury Common LWS	0.51	15.96	1.7	53.2
E24	Hazelbury Common LWS	0.43	15.88	1.4	52.9
E25	Kingsmoor Wood LWS and AW	2.00	17.45	6.7	58.2
E26	Botleaze Wood LWS	0.16	15.61	0.5	52.0
E27	Cottles Wood AW	0.14	15.59	0.5	52.0

5.5.8 EA guidance 'Air emissions risk assessment for your environmental permit'[21] states that PCs at SSSIs and SACs can be screened as insignificant if they meet the following criteria:

- The long-term PC is less than 1% of the long-term environmental standard for protected conservation areas; or,
- The long-term PC is greater than 1% and the long term PEC is less than 70% of the long term environmental standard.

5.5.9 PCs at LWSs can be screened as insignificant if they meet the following criteria:

- The short-term PC is less than 100% of the short-term environmental standard for protected conservation areas; and,
- The long-term PC is less than 100% of the long-term environmental standard for protected conservation areas.

5.5.10 As shown in Table 27, PCs were below the relevant criteria at all ecological designations. As such, predicted effects on annual mean NO_x concentrations are not considered to be significant.

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

Sulphur Dioxide

5.5.11 Maximum predicted annual mean SO_2 concentrations at the ecological receptor locations based on a total operational period of 76.75-hours per annum are summarised in Table 28.

Table 28 Predicted Annual Mean SO_2 Concentrations - Ecological Receptors

Receptor		Maximum Predicted Annual Mean SO_2 Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.000	0.810	0.0	8.1
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.000	0.810	0.0	8.1
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.000	0.810	0.0	8.1
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.000	0.810	0.0	8.1
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.000	0.810	0.0	8.1
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.000	0.810	0.0	8.1
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.000	0.810	0.0	8.1
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.000	0.810	0.0	8.1
E9	Corsham Railway Cutting SSSI	0.000	0.800	0.0	8.0
E10	By Brook LWS	0.000	0.790	0.0	7.9
E11	By Brook LWS	0.000	0.790	0.0	7.9
E12	By Brook LWS	0.000	0.790	0.0	7.9
E13	By Brook LWS	0.000	0.790	0.0	7.9
E14	By Brook LWS	0.000	0.790	0.0	7.9
E15	By Brook LWS	0.000	0.790	0.0	7.9

Receptor		Maximum Predicted Annual Mean SO_2 Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
E16	By Brook LWS	0.000	0.790	0.0	7.9
E17	Hungerford Wood LWS	0.000	0.750	0.0	7.5
E18	Tilley's Wood LWS	0.000	0.750	0.0	7.5
E19	White Wood, Box LWS and AW	0.000	0.790	0.0	7.9
E20	Hazelbury Fields LWS	0.000	0.790	0.0	7.9
E21	Hazelbury Fields LWS	0.000	0.790	0.0	7.9
E22	Privett's Wood LWS and AW	0.000	0.790	0.0	7.9
E23	Hazelbury Common LWS	0.000	0.790	0.0	7.9
E24	Hazelbury Common LWS	0.000	0.790	0.0	7.9
E25	Kingsmoor Wood LWS and AW	0.001	0.791	0.0	7.9
E26	Botleaze Wood LWS	0.000	0.790	0.0	7.9
E27	Cottles Wood AW	0.000	0.800	0.0	8.0

5.5.12 As shown in Table 28, PCs were below the relevant criteria at all ecological designations. As such, predicted effects on annual mean SO_2 concentrations are not considered to be significant.

Nitrogen Deposition

5.5.13 Maximum predicted annual nitrogen deposition rates at the ecological receptor locations based on a total operational period of 76.75-hours per annum are summarised in Table 29.

Table 29 Predicted Annual Nitrogen Deposition Rates - Ecological Receptors

Receptor		Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
		PC	PEC	Low EQS		High EQS	
				PC	PEC	PC	PEC
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.015	32.615	0.2	326.2	0.1	163.1
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.017	32.617	0.2	326.2	0.1	163.1
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.013	32.613	0.1	326.1	0.1	163.1
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.016	32.616	0.2	326.2	0.1	163.1
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.018	32.618	0.2	326.2	0.1	163.1
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.023	32.623	0.2	326.2	0.1	163.1
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.042	32.642	0.4	326.4	0.2	163.2
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.036	32.636	0.4	326.4	0.2	163.2
E9	Corsham Railway Cutting SSSI	0.030	22.430	-	-	-	-
E10	By Brook LWS	0.005	32.625	0.0	326.2	0.0	163.1
E11	By Brook LWS	0.004	32.624	0.0	326.2	0.0	163.1
E12	By Brook LWS	0.004	32.624	0.0	326.2	0.0	163.1
E13	By Brook LWS	0.004	32.624	0.0	326.2	0.0	163.1
E14	By Brook LWS	0.004	32.624	0.0	326.2	0.0	163.1

Receptor		Predicted Annual Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
		PC	PEC	Low EQS		High EQS	
				PC	PEC	PC	PEC
E15	By Brook LWS	0.005	32.625	0.0	326.2	0.0	163.1
E16	By Brook LWS	0.005	32.625	0.1	326.3	0.0	163.1
E17	Hungerford Wood LWS	0.004	32.904	0.0	329.0	0.0	164.5
E18	Tilley's Wood LWS	0.004	32.904	0.0	329.0	0.0	164.5
E19	White Wood, Box LWS and AW	0.012	32.632	0.1	326.3	0.1	163.2
E20	Hazelbury Fields LWS	0.006	19.326	0.0	128.8	0.0	77.3
E21	Hazelbury Fields LWS	0.008	19.328	0.1	128.9	0.0	77.3
E22	Privett's Wood LWS and AW	0.016	32.636	0.2	326.4	0.1	163.2
E23	Hazelbury Common LWS	0.011	19.331	0.1	128.9	0.0	77.3
E24	Hazelbury Common LWS	0.009	19.329	0.1	128.9	0.0	77.3
E25	Kingsmoor Wood LWS and AW	0.086	32.706	0.9	327.1	0.4	163.5
E26	Botleaze Wood LWS	0.007	32.627	0.1	326.3	0.0	163.1
E27	Cottles Wood AW	0.006	38.226	0.1	382.3	0.0	191.1

5.5.14 As shown in Table 29, PCs were below the relevant criteria at all ecological designations. As such, predicted effects on nitrogen deposition are not considered to be significant.

Acid Deposition

5.5.15 Maximum predicted annual acid deposition rates at the ecological receptor locations based on a total operational period of 76.75-hours per annum are summarised in Table 30.

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Table 30 Predicted Annual Acid Deposition Rates - Ecological Receptors

Receptor		Maximum Predicted Annual Acid PC Deposition Rate (keq/ha/yr)		Proportion of EQS (%)
		N	S	
E1	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.00110	0.00003	0.0
E2	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.00122	0.00003	0.0
E3	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.00090	0.00002	0.0
E4	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.00112	0.00003	0.0
E5	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.00129	0.00004	0.0
E6	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.00163	0.00004	0.0
E7	Bath & Bradford on Avon Bats SAC, Box Mine SSSI and Box Hill Common LWS	0.00298	0.00008	0.0
E8	Bath & Bradford on Avon Bats SAC and Box Mine SSSI	0.00254	0.00007	0.0
E9	Corsham Railway Cutting SSSI	0.00212	0.00006	-
E10	By Brook LWS	0.00034	0.00001	0.0
E11	By Brook LWS	0.00030	0.00001	0.0
E12	By Brook LWS	0.00030	0.00001	0.0
E13	By Brook LWS	0.00030	0.00001	0.0
E14	By Brook LWS	0.00031	0.00001	0.0
E15	By Brook LWS	0.00035	0.00001	0.0
E16	By Brook LWS	0.00037	0.00001	0.0
E17	Hungerford Wood LWS	0.00032	0.00001	0.0
E18	Tilley's Wood LWS	0.00031	0.00001	0.0
E19	White Wood, Box LWS and AW	0.00085	0.00002	0.0
E20	Hazelbury Fields LWS	0.00044	0.00001	0.0
E21	Hazelbury Fields LWS	0.00060	0.00002	0.0
E22	Privett's Wood LWS and AW	0.00117	0.00003	0.0
E23	Hazelbury Common LWS	0.00078	0.00002	0.0

Receptor		Maximum Predicted Annual Acid PC Deposition Rate (keq/ha/yr)		Proportion of EQS (%)
		N	S	
E24	Hazelbury Common LWS	0.00066	0.00002	0.0
E25	Kingsmoor Wood LWS and AW	0.00615	0.00016	0.1
E26	Botleaze Wood LWS	0.00049	0.00001	0.0
E27	Cottles Wood AW	0.00042	0.00001	0.0

5.5.16 As shown in Table 30, PCs were below the relevant criteria at all ecological designations. As such, predicted effects on acid deposition are not considered to be significant.

6.0 CONCLUSION

6.1.1 Redmore Environmental Ltd was commissioned by EHS Projects Ltd to undertake an Air Quality Assessment in relation to Spring Park Data Centre, Westwells Road, Corsham.

6.1.2 Atmospheric emissions from diesel-fired standby generators at the site have the potential to cause air quality impacts at sensitive locations. As such, an Air Quality Assessment was undertaken in order to quantify potential effects during the following three operating scenarios:

- Event 1 - Standby generator test;
- Event 2 - Annual service test; and,
- Event 3 - Grid outage event.

6.1.3 Dispersion modelling of NO_x, CH_2O, CO, and SO_2 emissions was undertaken using ADMS-5. Impacts at sensitive receptors were quantified for the three separate Event scenarios and the results compared with the relevant EQSs.

6.1.4 Predicted pollutant concentrations for Event 1, representing standby generator bank testing, were below the relevant EQSs at all receptor locations, with the exception of 10-minute NO_2 concentrations at three receptors and 30-minute NO_2 concentrations at one receptor. However, this was based on an extreme worst-case scenario of the standby test coinciding with the worst-case meteorological conditions. Given the tests are only undertaken over a period of 15-minutes three times per annum, this is very unlikely to occur and can be avoided through timing of the event during periods of appropriate weather. A suitable procedure can be secured as part of the Air Quality Management Plan for the site. As such, impacts during Event 1 are not considered to be significant, subject to control of timing of HV Gen Farm testing.

6.1.5 Predicted pollutant concentrations for Event 2, representing annual standby generator testing, were below the relevant EQSs at all receptor locations. As such, impacts are not considered to be significant.

6.1.6 Predicted pollutant concentrations for Event 3, representing a 72-hour grid outage, were below the relevant EQSs at all human receptor locations, with the exception of the 1-hour mean AQO for NO_2 and 1-hour mean EAL for CH_2O. However, following further results analysis and consideration of the risk of potential EQS exceedence, impacts are not deemed to be significant.

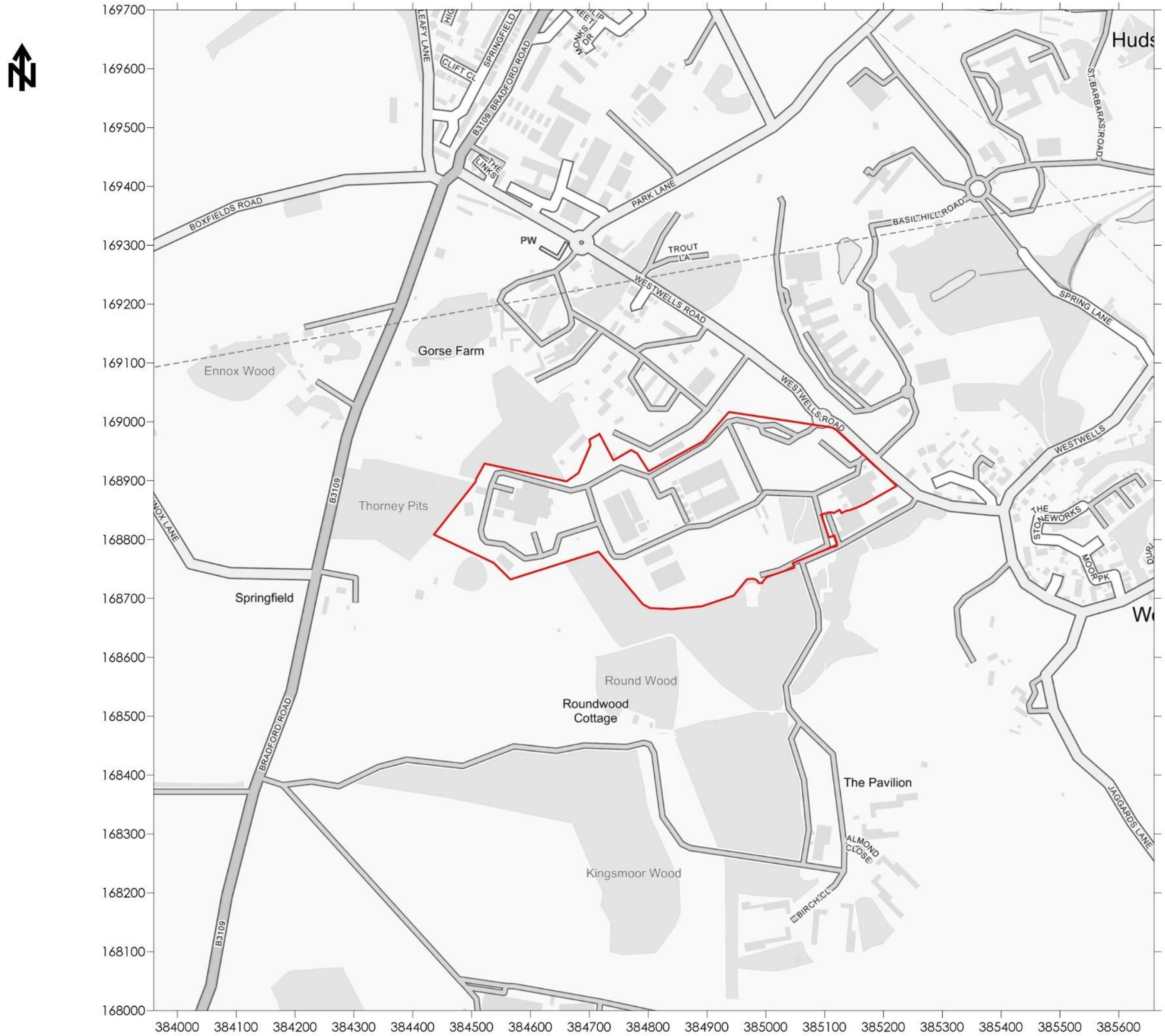
6.1.7 The risk of EQS exceedence at sensitive ecological receptors during Event 3 was predicted to be below 1%. As such, impacts are not considered to be significant.

6.1.8 Impacts on long-term pollutant concentrations were not predicted to be significant at any human or ecological receptor.

7.0 ABBREVIATIONS

AEGL	Acute Exposure Guideline Level
APIS	Air Pollution Information System
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AW	Ancient Woodland
CERC	Cambridge Environmental Research Consultants
C_6H_6	Benzene
CH_2O	Formaldehyde
CO	Carbon monoxide
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EAL	Environmental Assessment Level
EQS	Environmental Quality Standard
LAQM	Local Air Quality Management
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
NGR	National Grid Reference
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10µm
SAC	Special Area of Conservation
SCR	Selective Catalytic Reduction
SO_2	Sulphur dioxide
SSSI	Site of Special Scientific Interest
WC	Wiltshire Council
US EPA	United States Environmental Protection Agency
z_0	Roughness length
%ile	Percentile

Figures



Legend

Site Boundary

Title
Figure 1 - Site Location

Project
Air Quality Assessment
Spring Park Data Centre, Corsham

Project Reference
3650

Client
EHS Projects Ltd

Redmore environmental

www.red-env.co.uk | 0161 7060075

Legend

Title
Figure 2 - Site Layout

Project
Air Quality Assessment
Spring Park Data Centre, Corsham

Project Reference
3650

Client
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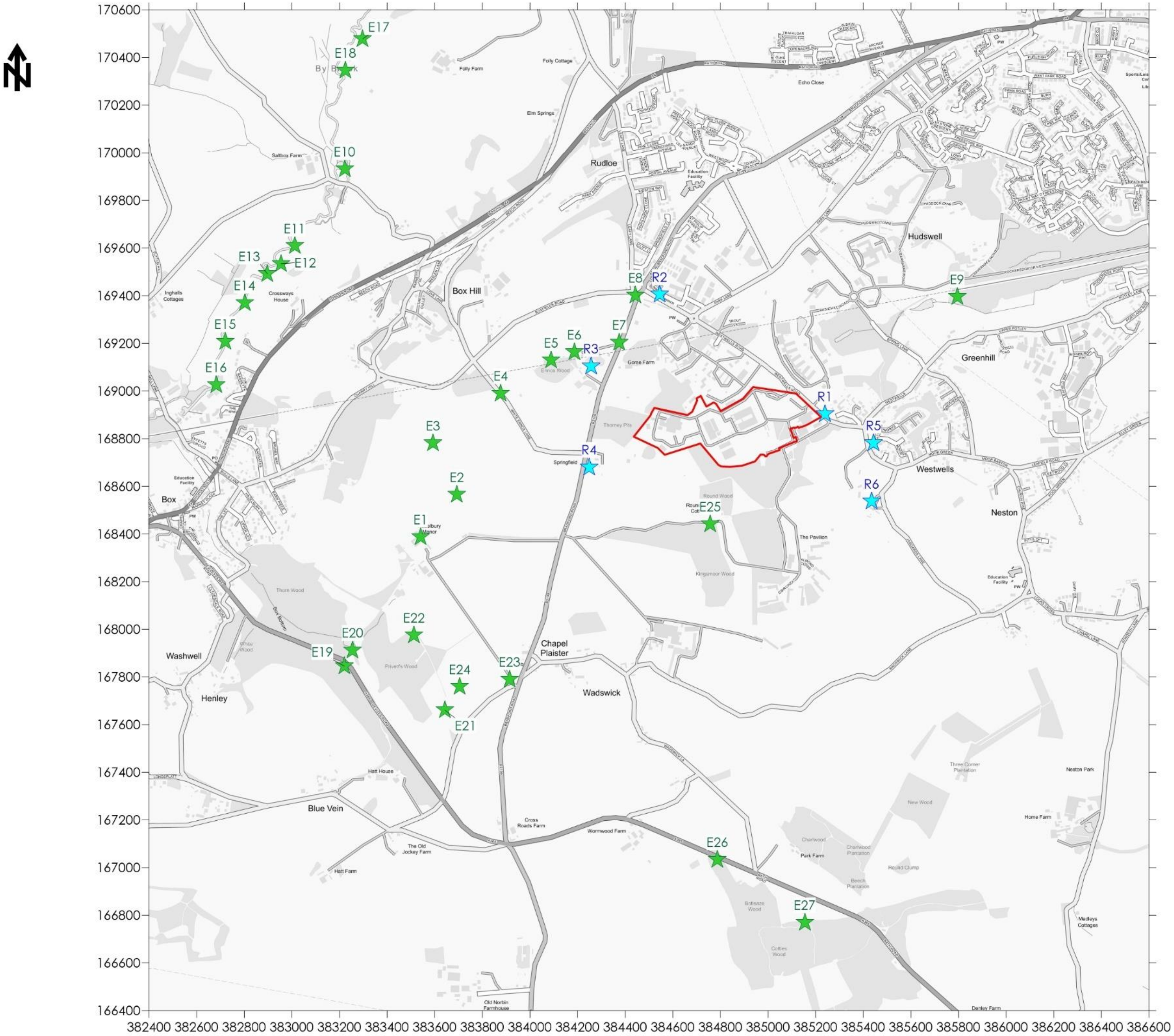

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Site Boundary

Human Receptor

Ecological Receptor

Title

Figure 3 - Sensitive Receptors

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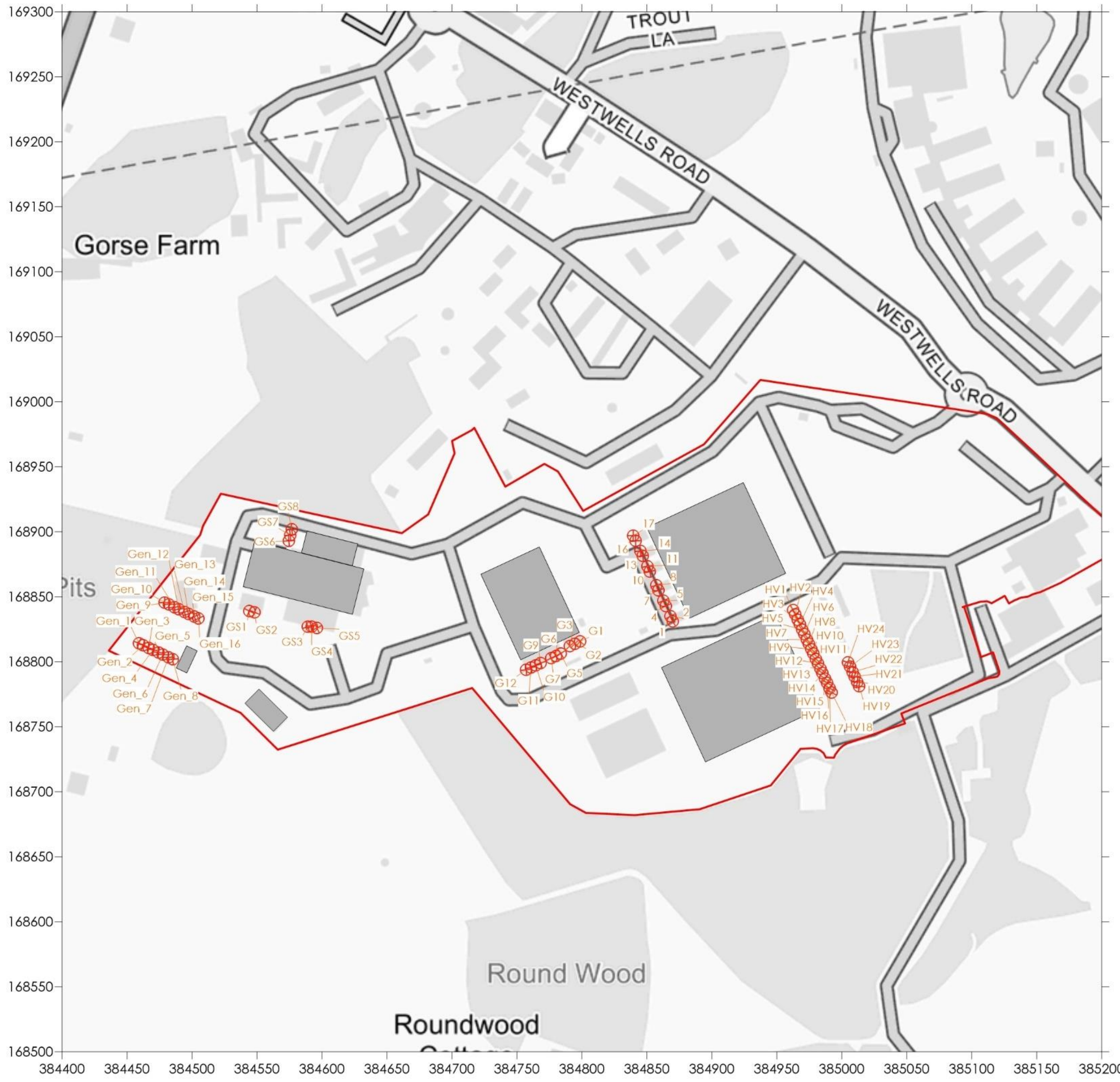

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Site Boundary

Emission Point

Building

Title
Figure 4 - ADMS-5 Inputs

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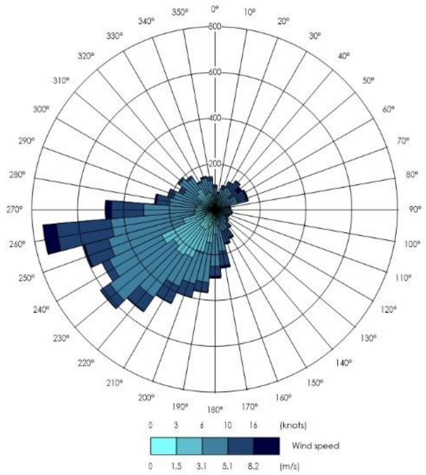
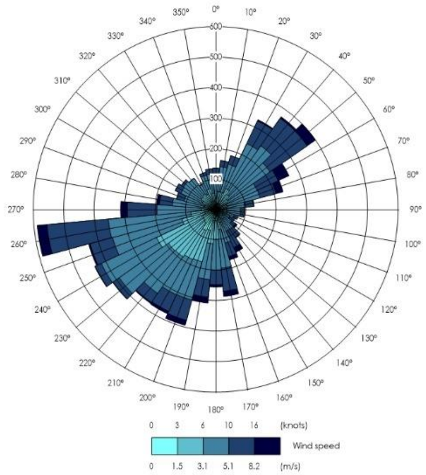
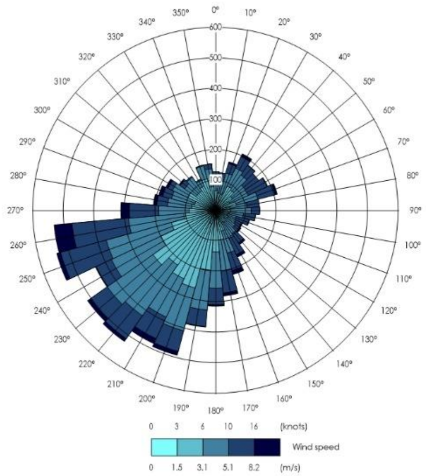


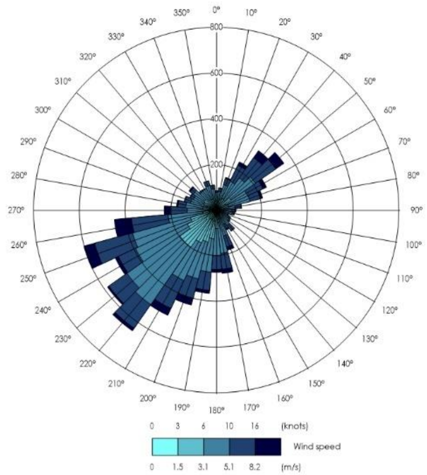
2017 Meteorological Data



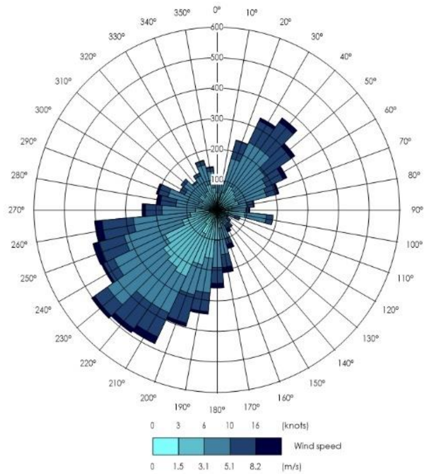
2018 Meteorological Data



2019 Meteorological Data



2020 Meteorological Data



2021 Meteorological Data

Legend

Title
Figure 5 - Wind Roses of 2017 to 2021 Lyneham Meteorological Data

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Air Quality Assessment
Spring Park Data Centre, Corsham

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