Air Quality Assessment

Bridgwater Power Generation Plant

Client: Conrad (Bridgwater) Limited

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Executive Summary

Redmore Environmental Ltd was commissioned by Conrad (Bridgwater) Limited to undertake an Air Quality Assessment in support of an Environmental Permit application for the Bridgwater Power Generation Plant on land off Axe Road, Bridgwater.

The installation will act as a flexible electricity generation plant and operate during peak periods to supply power to the National Grid.

The facility has the potential to cause air quality impacts as a result of atmospheric emissions during operation. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and assess potential changes in pollution levels as a result of the installation.

The results of the assessment indicated that the operation of the facility is not predicted to result in exceedences of the relevant air quality standards at any location within the vicinity of the installation. Impacts were classified as not significant in accordance with the relevant methodology.

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1.0 INTRODUCTION

1.1 Background

1.1.1 Redmore Environmental Ltd was commissioned by Conrad (Bridgwater) Limited to undertake an Air Quality Assessment in support of an Environmental Permit application for the Bridgwater Power Generation Plant on land off Axe Road, Bridgwater.

1.1.2 The facility has the potential to cause air quality impacts as a result of atmospheric emissions during operation. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and assess potential changes in pollution levels as a result of the installation.

1.2 Site Location and Context

1.2.1 The installation is located on land off Axe Road, Bridgwater, at National Grid Reference (NGR): 330839, 135911. Reference should be made to Figure 1 for a map of the site and surrounding area.

1.2.2 It is proposed to operate a gas fuelled generator set consisting of the following plant:

- One MTU 16V4000 GS engine with a thermal input of approximately 4.6MW; and,
- One Jenbacher J620 E12 engine with a thermal input of approximately 7.1MW.

1.2.3 The installation will act as a flexible electricity generation plant and operate during peak periods to supply power to the National Grid. It is anticipated that the plant will operate for a maximum of 3,000-hours per annum.

1.2.4 The operation of the plant may result in atmospheric emissions from the combustion of natural gas. These have the potential to cause air quality impacts at sensitive locations within the vicinity of the site and have therefore been quantified within this report.

2.0 LEGISLATION

2.1 Legislation

2.1.1 The Air Quality Standards Regulations (2010) and subsequent amendments include Air Quality Limit Values (AQLVs) for the following pollutants:

- Nitrogen dioxide (NO_2);
- Sulphur dioxide;
- Lead;
- Particulate matter with an aerodynamic diameter of less than 10µm;
- Particulate matter with an aerodynamic diameter of less than 2.5µm;
- Benzene; and,
- Carbon monoxide.

2.1.2 Air quality target values were also provided for several other pollutants.

2.1.3 The Air Quality Strategy (AQS) was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007[1]. 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 exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for the determination of compliance vary.

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

Table 1 Air Quality Objectives

Pollutant	Air Quality Objective	
	Concentration (µg/m^3)	Averaging Period
NO_2	40	Annual mean
	200	1-hour mean, not to be exceeded on more than 18 occasions per annum

[1] The AQS for England, Scotland, Wales and Northern Ireland, DEFRA, 2007.

2.1.5 Table 2 summarises the advice provided in DEFRA guidance[2] on where the AQOs for pollutants considered within this report apply.

Table 2 Examples of Where the Air Quality Objectives Apply

Averaging Period	Objective Should Apply At	Objective Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.2 Industrial Pollution Control Legislation

2.2.1 Atmospheric emissions from industry are controlled in the UK through the Environmental Permitting (England and Wales) Regulations (2016) and subsequent amendments. The operation of a specified generator is included within the Regulations. As such, the facility is required to obtain an Environmental Permit issued by the Environment Agency (EA). Conditions of operation will be stated Emission Limit Values (ELVs) for various pollutants produced by the process. Compliance with these conditions must be demonstrated through periodic monitoring requirements, which have been set in order to limit potential impacts in the surrounding area.

[2] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2021.

2.3 Local Air Quality Management

2.3.1 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, as summarised in Table 2, 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.

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), Sedgemoor District Council (SDC) has undertaken Review and Assessment of air quality within their area of jurisdiction. This process has indicated that concentrations of all pollutants considered within the AQS are currently below the relevant AQOs within the district. As such, no AQMAs have been designated within the council's administrative extents.

3.3 Air Quality Monitoring

3.3.1 Monitoring of pollutant concentrations is undertaken by SDC throughout their area of jurisdiction. Recent results recorded in the vicinity of the site are shown in Table .

Table 3 Monitoring Results

Monitoring Site		Monitored 2019 NO_2 Concentration (µg/m^3)
DT22	Taunton Road	25.92
DT31	Taunton Road	30.16
DT34	Top of Sedgemoor Road	19.49

3.3.2 As shown in 3, annual mean NO_2 concentrations were below the AQO at all monitoring sites in 2019. Reference should be made to Figure 2 for a map of the survey locations.

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: 330500, 135500. Data

for this location was downloaded from the DEFRA website[3] for the purpose of the assessment and is summarised in Table 3.

Table 3 Background Pollutant Concentration Predictions

Pollutant	Predicted 2022 Background Pollutant Concentration (µg/m³)
NO_2	8.48

3.4.2 As shown in Table 3, the predicted annual mean background NO_2 concentration is below the relevant AQO 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.

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 in Table 4.

Table 4 Sensitive Human Receptor Locations

Receptor		NGR (m)	
		X	Y
R1	Residential - Appledore Drive	330668.0	136462.7
R2	Residential - Heather Close	330920.9	136253.3
R3	Residential - Sedgemoor Road	331009.9	136010.0
R4	Residential - Plum Lane	331276.9	135815.1
R5	Residential - Marsh Lane	331104.6	135553.8
R6	Residential - Squibbers Lane	330856.1	135645.9

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

Receptor		NGR (m)	
		X	Y
R7	Residential - Chillingham Drove	330467.2	135000.8
R8	Residential - Taunton Road	330395.4	135527.8
R9	Residential - Taunton Road	330370.9	135726.3
R10	Residential - Roberts Drive	330350.8	135890.1
R11	Residential - Taunton Road	330239.5	136052.9
R12	Residential - Southside Avenue	330278.7	136316.0
R13	Residential - Sandpiper Close	330463.1	136613.3
R14	Residential - Colley Lane	330517.5	136577.1
R15	Residential - Appledore Drive	330628.0	136520.6

3.5.3 Reference should be made to Figure 2 for a map of the sensitive human receptor locations.

Ecological Receptors

3.5.4 A nature and habitant conservation screening undertaken by the EA on 9th August 2022 did not identify any sensitive ecological designations in the vicinity of the site that have the potential to be affected by emissions from the facility. Air quality impacts on ecological receptors were therefore not considered further in this assessment.

4.0 METHODOLOGY

4.1 Introduction

4.1.1 Emissions associated with the combustion of natural gas within the generators have the potential to cause increases in pollutant concentrations in the vicinity of the site. 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-5.2 (v5.2.4.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS-5 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 scenarios considered in the modelling assessment are summarised in Table 5.

Table 5 Assessment Scenarios

Parameter	Modelled As	
	Short Term	Long Term
NO_2	99.63rd percentile (%ile) 1-hour mean	Annual mean

4.3.2 Predicted pollutant concentrations were summarised in the following formats:

- Process Contribution (PC) - Predicted pollutant concentration as a result of emissions from the facility only; and,
- Predicted Environmental Concentration (PEC) - Total predicted pollutant concentration as a result of emissions from the facility and existing baseline levels.

4.3.3 Predicted ground level pollutant concentrations were compared with the relevant AQOs.

4.3.4 The EA have issued guidance[4] on dispersion modelling of emissions from generators. 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.

4.3.5 The facility will operate for a maximum of 3,000-hours per annum. Using the hypergeometric probability distribution method, it was determined that should the results indicate 32 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 3,000 operational hours would be 0.3%. As the plant can operate for periods in excess of 1-hour, this value was multiplied by 2.5 in accordance with the guidance[5]. This provided a probability of 0.8%. The EA indicate that:

"Probabilities of 1% or less indicate exceedances are highly unlikely."

4.3.6 This level of probability is considered to be acceptable to the EA. As such, it is an appropriate criterion for use in the assessment.

4.3.7 Based on the number of instances determined previously, the 99.63rd %ile was calculated for use in the modelling assessment. As such, should predicted 99.63rd %ile 1-hour mean NO_2 concentrations be under 200µg/m^3 then there is less than 1% probability of an AQO exceedence and the plant is considered acceptable in accordance with the utilised guidance[6].

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

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

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

4.3.8 The EA guidance[7] indicates that annual mean PCs can be calculated by scaling down long term predictions by the total number of operational hours over the total number of hours in the operating envelope. This approach was therefore adopted throughout the assessment.

4.4 Assessment Area

4.4.1 The assessment area was defined based on the facility location, anticipated pollutant dispersion patterns and the positioning of sensitive receptors. Ambient concentrations were predicted over NGR: 329885, 134965 to 331785, 136865. One Cartesian grid with a resolution of 10m was used within the model to produce data suitable for contour plotting using the Surfer software package.

4.4.2 Reference should be made to Figure 4 for a graphical representation of the assessment grid extents.

4.5 Process Conditions and Emissions

4.5.1 A summary of the inputs is provided in Table 6. These were derived from the technical data sheets for the generators and information provided by Conrad (Bridgwater) Limited.

Table 6 Process Conditions and Emissions

Parameter	Unit	Generator 1	Generator 2
Stack position	NGR	330838.8, 135909.2	330826.0, 135910.8
Stack height	m	7.0(a)	7.0(a)
Stack diameter	m	0.6	0.5
Exhaust gas temperature	°C	420	416
Exhaust gas volumetric flow rate(b)	Nm^3/hr	11,053	7,406
Exhaust gas volumetric flow rate	m^3/hr	28,057	20,196
Exhaust gas efflux velocity	m/s	27.56	28.57
Oxides of Nitrogen (NO_x) emission concentration(b)	mg/Nm^3	250	250

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

Parameter	Unit	Generator 1	Generator 2
NO_x emission rate	g/s	0.7676	0.5143

Note: (a) Height above ground level.
(b) Dry, 0°C, 5% Oxygen (O_2)

4.5.2 Reference should be made to Figure 4 for a map of the emission point locations.

4.6 NO_x to NO_2 Conversion

4.6.1 Emissions of total NO_x from combustion processes are predominantly in the form of nitric oxide (NO). Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO_2. Comparisons of ambient NO and NO_2 concentrations in the vicinity of point sources in recent years has indicated that it is unlikely that more than 30% of the NO_x is present at ground level as NO_2.

4.6.2 Ambient NO_x concentrations were predicted through dispersion modelling. Concentrations of NO_2 shown in the results section assume 70% conversion from NO_x to NO_2 for annual means and 35% conversion for 1-hour concentrations, based upon EA guidance[8].

4.7 Building Effects

4.7.1 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.

4.7.2 Analysis of the site layout indicated that several structures should be included within the model in order to take account of effects on pollutant dispersion. Input geometries are shown in Table 7.

8 Environmental permitting: air dispersion modelling reports, EA, 2018.

Table 7 Building Geometries

Building	NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
	X	Y				
Generator 1	330834.1	135903.3	3.6	15.7	3.7	217.5
Generator 2	330825.6	135908.2	3.5	17.5	3.2	217.5

4.7.3 Reference should be made to Figure 4 for a map of the building locations.

4.8 Meteorological Data

4.8.1 Meteorological data used in the assessment was taken from Bristol Lulsgate meteorological station over the period 1st January 2015 to 31st December 2019 (inclusive). This observation station is located at NGR: 349996, 164986, which is approximately 34.6km 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.

4.8.2 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 utilised meteorological records.

4.9 Roughness Length

4.9.1 Roughness length (z_0) is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents. This is considered appropriate for the morphology of the area and is suggested within ADMS-5 as being suitable for 'parkland, open suburbia'.

4.9.2 A z_0 of 0.3m was used to describe the meteorological site. This is considered appropriate for the morphology of the area and is suggested within ADMS-5 as being suitable for 'agricultural areas (min)'.

4.10 Monin-Obukhov Length

4.10.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 30m was used to describe the modelling extents. This is considered appropriate for the nature of the area and is suggested within ADMS-5 as being suitable for 'cities and large towns'.

4.10.2 A minimum Monin-Obukhov length of 10m was used to describe the meteorological site. This is considered appropriate for the nature of the area and is suggested within ADMS-5 as being suitable for 'small towns < 50,000'.

4.11 Terrain Data

4.11.1 Ordnance Survey OS Terrain 50 data was included in the model for the site and surrounding area in order to take account of the specific flow field produced by variations in ground height throughout the assessment extents. This was pre-processed using the method suggested by CERC[9].

4.12 Background Concentrations

4.12.1 Review of existing data in the vicinity of the site was undertaken in Section 3.0 in order to identify suitable background values for use in the assessment. This indicated that the annual mean NO_2 concentration recorded at DT22 in 2019, as shown in Table , was considered most representative of baseline conditions at receptors close to the A38. As such, an annual mean NO_2 concentration of 25.92µg/m^3 was used to represent background levels at R7 to R11. All other receptors and the facility location are set back from major roads. As such, the background NO_2 concentration of 8.48µg/m^3 predicted by DEFRA was utilised to represent baseline conditions at these positions.

4.12.2 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

[9] Note 105: Setting up Terrain Data for Input to CERC Models, CERC, 2016.

for your environmental permit'[10], 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.

4.13 Assessment Criteria

4.13.1 EA guidance 'Air emissions risk assessment for your environmental permit'[11] states that PCs can be screened as insignificant if they meet the following criteria:

- The short-term PC is less than 10% of the short-term environmental standard; and,
- The long-term PC is less than 1% of the long-term environmental standard.

4.13.2 If these criteria are exceeded the following guidance is provided on when whether impacts can be screened as insignificant:

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and,
- The long-term PEC is less than 70% of the long-term environmental standards.

4.13.3 Should these criteria be exceeded then additional consideration to potential impacts should be provided.

4.14 Modelling Uncertainty

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

- 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.

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

[11] Air emissions risk assessment for your environmental permit, EA, 2016.

4.14.2 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 the closest observation station to the site. The analysis was based on the worst-case year for each averaging period 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. Terrain data was included and processed using the method outlined by CERC;
- Plant operating conditions - Operational parameters were obtained from the relevant technical data sheets for the generators. As such, these are considered to be representative of normal operating conditions;
- Emission rates - The emission rates were derived from the relevant generator specifications. As such, these are considered to be representative of maximum releases;
- Background concentrations - Background pollutant levels were obtained from the DEFRA website and local monitoring results. These are considered representative of baseline air quality conditions at sensitive locations within the vicinity of the site;
- Receptor locations - A Cartesian Grid was included in the model in order to provide suitable data for contour plotting. Receptor points were also included at sensitive locations to provide additional consideration of these areas; 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.

4.14.3 Results were considered in the context of the relevant AQOs and EA significance criteria. 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 Maximum Pollutant Concentrations

5.2.1 Maximum predicted pollutant concentrations at any point within the modelling extents for any meteorological data set are summarised in Table 8.

Table 8 Maximum Predicted Pollutant Concentrations

Pollutant	Averaging Period	AQO (µg/m³)	PC (µg/m³)	PC Proportion of AQO (%)	PEC (µg/m³)	PEC Proportion of AQO (%)
NO_2	Annual	40	6.07	15.18	14.95	37.38
	99.63rd %ile 1-hour	200	74.40	37.20	92.16	46.08

5.2.2 As shown in Table 8, there were no predicted exceedences of any AQO at any location for any pollutant or averaging period of interest.

5.2.3 Reference should be made to Figure 6 and Figure 7 for graphical representations of predicted pollutant concentrations, inclusive of background levels, throughout the assessment extents.

5.2.4 It should be noted that the data shown in the Figures are predictions from the meteorological data set which resulted in the maximum pollutant concentration for that species. For example, the maximum annual mean NO_2 concentration was predicted using the 2017 meteorological data set. As such, the contours shown in Figure 6 were produced from the 2017 model outputs.

5.3 Sensitive Receptors

5.3.1 Predicted annual mean NO_2 PECs at the sensitive receptor locations are summarised in Table 9.

Table 9 Predicted Annual Mean NO_2 Concentrations

Receptor		Predicted Annual Mean NO_2 PEC (µg/m³)				
		2015	2016	2017	2018	2019
R1	Residential - Appledore Drive	8.98	8.98	9.01	8.99	9.00
R2	Residential - Heather Close	9.37	9.26	9.31	9.26	9.31
R3	Residential - Sedgemoor Road	10.48	10.31	10.60	10.22	10.31
R4	Residential - Plum Lane	9.17	9.15	9.21	9.13	9.17
R5	Residential - Marsh Lane	8.95	8.97	8.98	8.97	8.95
R6	Residential - Squibbers Lane	9.07	9.07	9.04	9.11	9.07
R7	Residential - Chillingham Drove	25.98	25.97	25.96	26.00	25.97
R8	Residential - Taunton Road	26.06	26.10	26.01	26.12	26.02
R9	Residential - Taunton Road	26.09	26.14	26.04	26.12	26.08
R10	Residential - Roberts Drive	26.07	26.10	26.02	26.07	26.12
R11	Residential - Taunton Road	26.02	26.04	26.00	26.01	26.06
R12	Residential - Southside Avenue	8.94	8.96	8.95	8.96	8.97
R13	Residential - Sandpiper Close	8.93	8.93	8.95	8.94	8.94
R14	Residential - Colley Lane	8.94	8.94	8.96	8.95	8.95
R15	Residential - Appledore Drive	8.96	8.96	8.99	8.97	8.98

5.3.2 As indicated in Table 9, annual mean NO_2 PECs were below the AQO of 40µg/m³ at all sensitive receptor locations for all meteorological data sets.

5.3.3 Reference should be made to Figure 6 for a graphical representation of predicted annual mean NO_2 concentrations throughout the assessment extents.

5.3.4 Maximum predicted annual mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 10.

Table 10 Maximum Predicted Annual Mean NO_2 Concentrations

Receptor		Maximum Predicted Annual Mean NO_2 Concentration (µg/m³)		Proportion of AQO (%)	
		PC	PEC	PC	PEC
R1	Residential - Appledore Drive	0.13	9.01	0.32	22.52
R2	Residential - Heather Close	0.49	9.37	1.23	23.43
R3	Residential - Sedgemoor Road	1.72	10.60	4.30	26.50
R4	Residential - Plum Lane	0.33	9.21	0.83	23.03
R5	Residential - Marsh Lane	0.10	8.98	0.26	22.46
R6	Residential - Squibbers Lane	0.23	9.11	0.58	22.78
R7	Residential - Chillingham Drove	0.08	26.00	0.19	64.99
R8	Residential - Taunton Road	0.20	26.12	0.50	65.30
R9	Residential - Taunton Road	0.22	26.14	0.54	65.34
R10	Residential - Roberts Drive	0.20	26.12	0.49	65.29
R11	Residential - Taunton Road	0.14	26.06	0.36	65.16
R12	Residential - Southside Avenue	0.09	8.97	0.22	22.42
R13	Residential - Sandpiper Close	0.07	8.95	0.17	22.37
R14	Residential - Colley Lane	0.08	8.96	0.19	22.39
R15	Residential - Appledore Drive	0.11	8.99	0.26	22.46

5.3.5 As indicated in Table 10, PCs were below 1% of the AQO at 13 receptors and above at two locations. However, the PEC at these positions was below 70% of the AQO. As such, predicted effects on annual mean NO_2 concentrations are not considered to be significant, in accordance with the EA criteria.

5.3.6 Predicted 99.63rd %ile 1-hour mean NO_2 PECs at the sensitive receptor locations are summarised in Table 11.

Table 11 Predicted 99.63rd %ile 1-hour Mean NO_2 Concentrations

Receptor		Predicted 99.63rd %ile 1-hour Mean NO_2 PEC (µg/m³)				
		2015	2016	2017	2018	2019
R1	Residential - Appledore Drive	21.38	21.45	21.48	21.39	21.46
R2	Residential - Heather Close	25.18	24.99	25.06	25.06	25.02
R3	Residential - Sedgemoor Road	32.35	32.11	32.32	32.13	32.29
R4	Residential - Plum Lane	23.24	23.16	23.39	23.29	23.17
R5	Residential - Marsh Lane	22.37	22.87	22.91	22.64	22.46
R6	Residential - Squibbers Lane	27.06	27.22	27.05	27.14	27.38
R7	Residential - Chillingham Drove	54.33	54.14	53.83	54.22	53.85
R8	Residential - Taunton Road	55.67	55.76	55.44	55.57	55.42
R9	Residential - Taunton Road	56.67	56.88	56.42	56.35	56.42
R10	Residential - Roberts Drive	56.77	56.99	56.35	56.88	56.82
R11	Residential - Taunton Road	55.49	56.00	55.22	55.32	55.62
R12	Residential - Southside Avenue	20.83	20.90	20.85	20.90	21.00
R13	Residential - Sandpiper Close	20.20	20.35	20.36	20.43	20.30
R14	Residential - Colley Lane	20.52	20.69	20.57	20.56	20.53
R15	Residential - Appledore Drive	20.98	21.14	20.98	20.86	21.01

5.3.7 As indicated in Table 11, 99.63rd %ile 1-hour mean NO_2 PECs were below the AQO of 200µg/m³ at all sensitive receptor locations for all meteorological data sets.

5.3.8 Reference should be made to Figure 7 for a graphical representation of predicted 99.63rd %ile 1-hour mean NO_2 concentrations throughout the assessment extents.

5.3.9 Maximum predicted 99.63rd %ile 1-hour mean NO_2 concentrations at the sensitive receptor locations are summarised in Table 12.

Table 12 Maximum Predicted 99.63rd %ile 1-hour Mean NO_2 Concentrations

Receptor		Maximum Predicted 99.63rd %ile 1-hour Mean NO_2 Concentration (µg/m³)		PC Proportion of AQO (%)	PC Proportion of AQO Headroom (%)[a]
		PC	PEC		
R1	Residential - Appledore Drive	3.72	21.48	1.9	2.0
R2	Residential - Heather Close	7.42	25.18	3.7	4.1
R3	Residential - Sedgemoor Road	14.59	32.35	7.3	8.0
R4	Residential - Plum Lane	5.63	23.39	2.8	3.1
R5	Residential - Marsh Lane	5.15	22.91	2.6	2.8
R6	Residential - Squibbers Lane	9.62	27.38	4.8	5.3
R7	Residential - Chillingham Drove	2.49	54.33	1.2	1.7
R8	Residential - Taunton Road	3.92	55.76	2.0	2.6
R9	Residential - Taunton Road	5.04	56.88	2.5	3.4
R10	Residential - Roberts Drive	5.15	56.99	2.6	3.5
R11	Residential - Taunton Road	4.16	56.00	2.1	2.8
R12	Residential - Southside Avenue	3.24	21.00	1.6	1.8
R13	Residential - Sandpiper Close	2.67	20.43	1.3	1.5
R14	Residential - Colley Lane	2.93	20.69	1.5	1.6
R15	Residential - Appledore Drive	3.38	21.14	1.7	1.9

Note: [a] PC proportion of AQO minus twice the long-term background concentration.

5.3.10 As indicated in Table 12, PCs were below 10% of the AQO at all sensitive receptor locations. As such, predicted effects on 1-hour mean NO_2 concentrations are not considered to be significant, in accordance with the EA criteria.

6.0 CONCLUSION

6.1.1 Redmore Environmental Ltd was commissioned by Conrad (Bridgwater) Limited to undertake an Air Quality Assessment in support of an Environmental Permit application for the Bridgwater Power Generation Plant on land off Axe Road, Bridgwater.

6.1.2 The facility has the potential to cause air quality impacts as a result of atmospheric emissions during operation. As such, an Air Quality Assessment was undertaken in order to determine baseline conditions and assess potential changes in pollution levels as a result of the installation.

6.1.3 Dispersion modelling of NO_x emissions was undertaken using ADMS-5. Impacts at sensitive receptors were quantified and the results compared with the relevant AQOs and EA significance criteria.

6.1.4 Review of the dispersion modelling results indicated that emissions from the generators were not predicted to cause significant air quality impacts at any sensitive receptor location. In addition, annual and 1-hour mean NO_2 concentrations were predicted to be below the relevant AQOs of 40µg/m^3 and 200µg/m^3, respectively, at all locations in the vicinity of the site.

7.0 ABBREVIATIONS

AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
PC	Process Contribution
PEC	Predicted Environmental Concentration
SDC	Sedgemoor District Council
z_0	Roughness length
%ile	Percentile

Figures

Legend

Site Boundary

Title
Figure 1 - Site Location Plan

Project
Air Quality Assessment
Bridgwater Power Generation Plant

Project Reference
3693-1

Client
Conrad (Bridgwater) Limited

Redmore environmental
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Legend

Site Boundary

Monitor

Title
Figure 2 - Monitoring Locations

Project
Air Quality Assessment
Bridgwater Power Generation Plant

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Site Boundary

Sensitive Receptor

Title
Figure 3 - Sensitive Receptor Locations

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Legend

- Site Boundary
- Stack
- Output Grid
- Building

Title
Figure 4 - ADMS-5 Inputs

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Air Quality Assessment
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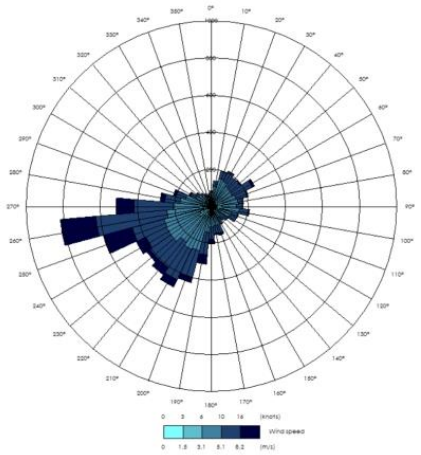
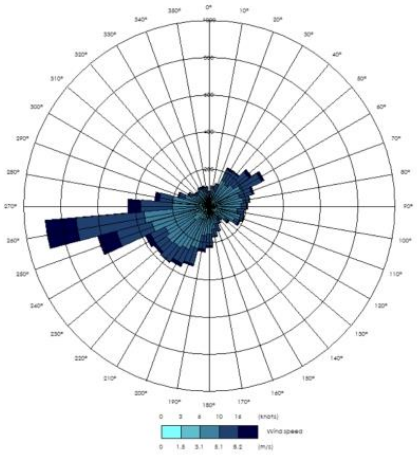
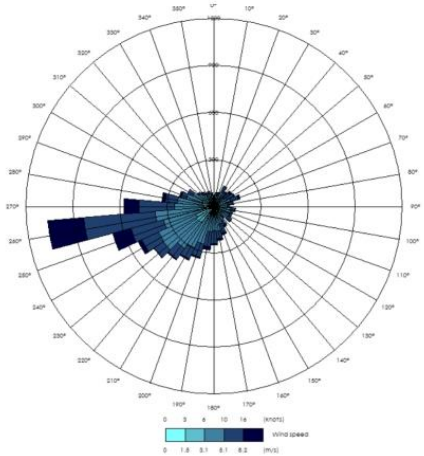


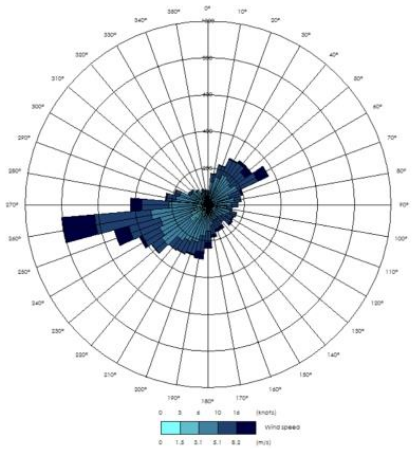
2015 Meteorological Data



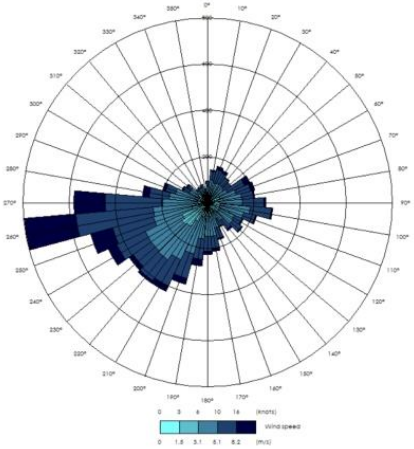
2016 Meteorological Data



2017 Meteorological Data



2018 Meteorological Data



2019 Meteorological Data

Legend

Title
Figure 5 - Wind Roses of 2015 to 2019 Bristol Lulsgate Meteorological Data

Project
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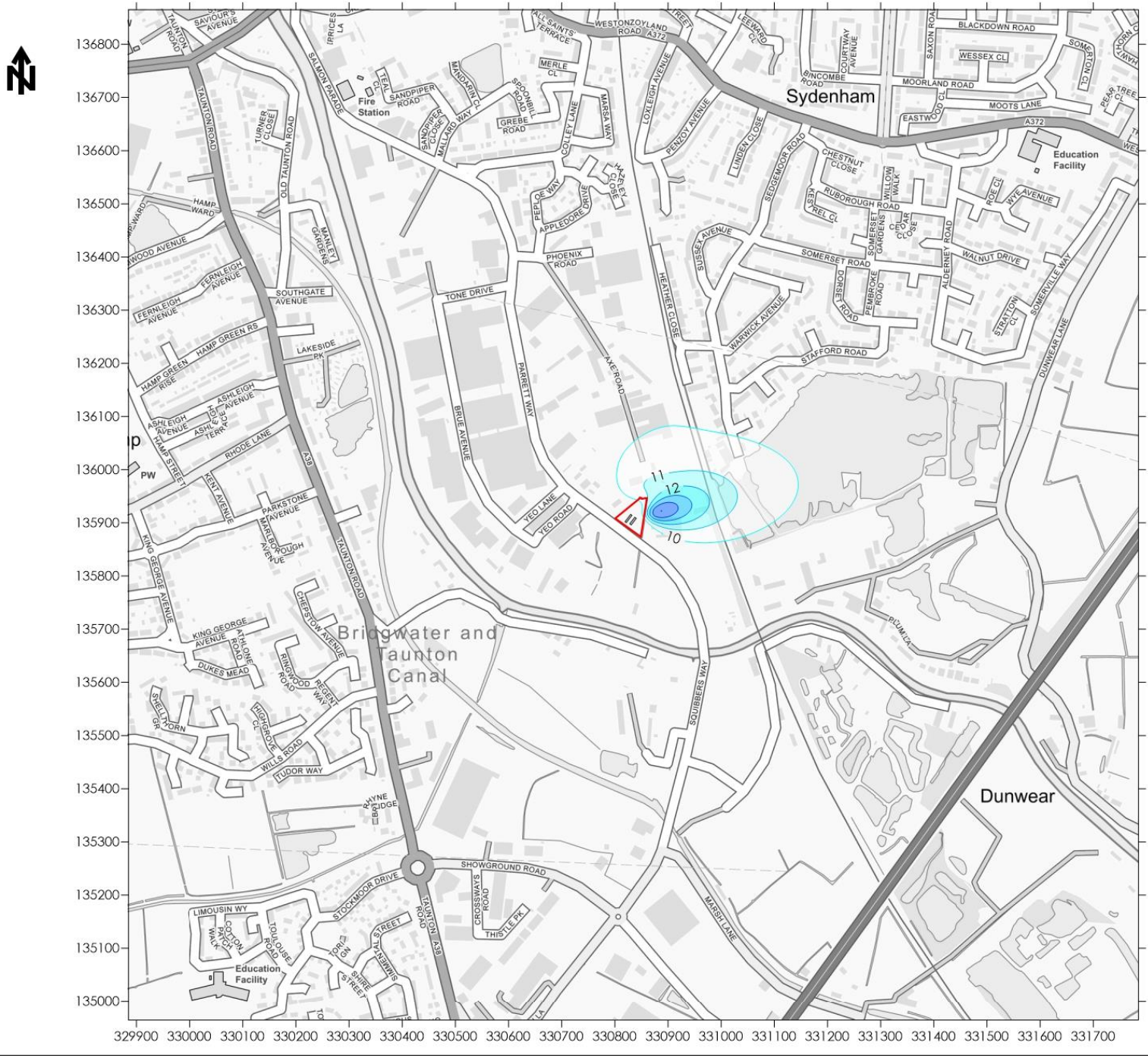

Legend

Site Boundary

Annual Mean NO_2 Concentration ($\mu g/m^3$)

15
14
13
12
11
10

Title

Figure 6 - Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2017 Meteorological Data

Project

Air Quality Assessment
Bridgwater Power Generation Plant

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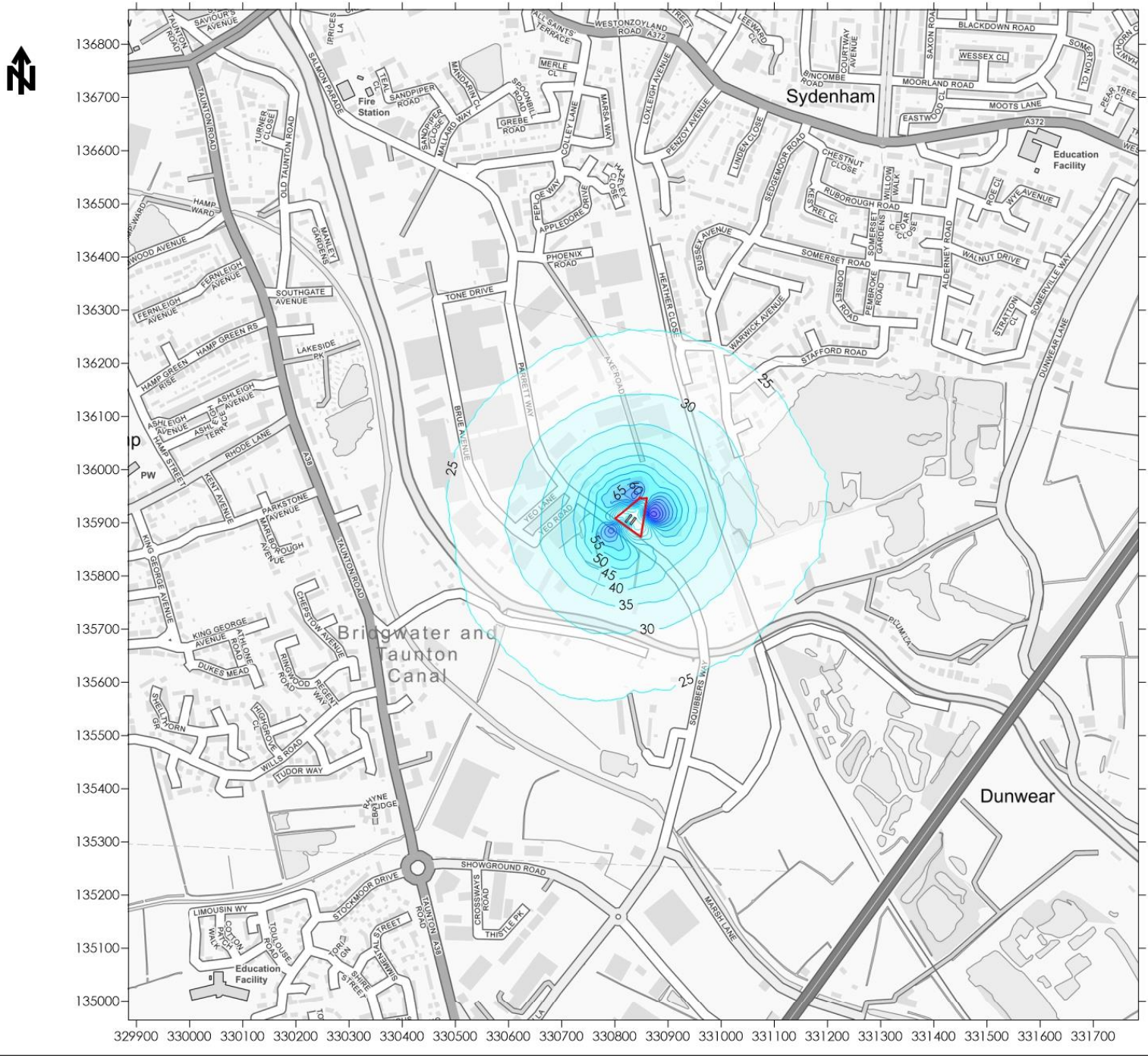

Legend

Site Boundary

99.63rd %ile 1-hour Mean NO_2 Concentration (µg/m³)

90
85
80
75
70
65
60
55
50
45
40
35
30
25

Title

Figure 7 - Predicted 99.63rd %ile 1-hour Mean NO_2 Concentrations (µg/m³) 2018 Meteorological Data

Project

Air Quality Assessment
Bridgwater Power Generation Plant

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