



Air Quality impact assessment

Wardentree Lane Anaerobic Digestion Facility

Report for ET Biogas Ventures Ltd

Customer:

ET Biogas Ventures Ltd

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Contact:

Dr Nigel Gibson
Ricardo-AEA Ltd
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom
t: +44 (0) 1235 75 3609
e: nigel.gibson@ricardo-aea.com
Ricardo-AEA is certificated to ISO9001 and ISO14001

Author:

Dr Nigel Gibson

Approved By:

Brian Donovan

Date:

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1 Introduction

1.1 Overview

This assessment considers the Combined Heat and Power (CHP) gas engines at the 100,000 tonne per annum AD facility on land off Wardentree Lane.

This facility will supply gas to the gas network and will combust only a portion of the biogas generated by the AD process to generate heat and electricity. The biogas consists predominantly of methane. The CHP engine, rated at 500kW, will discharge combustion gases to atmosphere from a single stack at a recommended height of 12m above ground level.

1.2 Emission to air

The principal substances of concern are oxides of nitrogen (NO_x), sulphur dioxide (SO₂), volatile organic carbon (VOC) and carbon monoxide (CO).

Emissions of acidic compounds and nitrogen-containing substances from the CHP engines could potentially affect sensitive habitat sites. This could occur if the pH balance in soils at sensitive sites were to be influenced by the deposition of acid gases directly, or as acids in rainwater. Increased levels of nitrogen in soils and water bodies can result in the growth of unwanted species, at the expense of other species which have evolved to cope with low levels of nitrogen (a process known as eutrophication). The substances of potential concern with regard to deposition comprise oxides of nitrogen and sulphur dioxide.

1.3 Scope of Study

Detailed dispersion modelling was carried out to determine the predicted ground level concentrations of NO_x, SO₂, VOC and CO at nearby sensitive locations due to emissions from the proposed CHP engine.

Point source emissions from the gas flare are not included in the modelling as the flare will only operate when the CHP unit is not available and no additional biogas can be stored in the biogas holder. The main mode of operation will be biogas discharge to the gas network and the CHP engine combusting biogas to produce heat and electricity and it is not anticipated that the flare will operate for significant periods of time.

Further details of the modelling methodology and study inputs are provided in Section 3.

2 Legislation and Planning Context

The AD facility, including the additional CHP engine, will require a permit to operate under the provisions of the Environmental Permitting (England and Wales) Regulations 2010¹. In order to be issued with an operating permit, the site will have to demonstrate that Best Available Techniques are being used to minimise emissions to air, and other media. A detailed assessment of controls on air pollutants and any residual air quality effects will be required as part of this process.

2.1 Combustion emissions

Standards and objectives for air quality are laid down in the Air Quality Standards Regulations 2010 No. 1001². The Air Quality Strategy³ sets out the approach to ensuring that these objectives are

¹ The Environmental Permitting Regulations (England and Wales) 2010, Statutory Instrument No. 675, March 2010

² The Air Quality Standards Regulations 2010 – Statutory Instrument 2010 No. 1001

³ Department of the Environment, Food and Rural Affairs, "Air Quality Strategy for England, Scotland, Wales and Northern Ireland", July 2007

achieved. The Air Quality Regulations include objectives for NO₂, NO_x, SO₂ and CO for the protection of human health and sensitive ecosystems and these are set out in Section 3.

The Conservation (Natural Habitats etc.) Regulations 1994 transpose the Habitats Directive (92/43/EEC) into national law. The Regulations provide for the designation and protection of "European sites," and the protection of "European protected species." As part of the planning process, the authority is required to carry out an appropriate assessment to establish whether a proposed development would adversely affect the integrity of any such European sites. Such a development could only be granted planning permission under very restricted circumstances.

2.2 National Planning Policy

The National Planning Policy Framework (NPPF), published in March 2012, sets out the government's over-arching planning policies. The aim of the NPPF is to ensure that the planning system operates in such a way as to achieve sustainable development.

As part of the NPPF, there are various references to air quality and pollution, such as in Section 11 (Conserving and enhancing the natural environment) sub paragraph 109:

"The planning system should contribute to and enhance the natural and local environment by:

- *preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability"*

Sub paragraph 120 in Section 11 of the NPPF states:

"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account."

Regarding air quality, sub paragraph 124 in Section 11 of the NPPF states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

2.3 Guidance

Environment Agency Guidance Note H1⁴ provides guidance on the assessment of Best Available Techniques for the purposes of the Environmental Permitting regime. This guidance note sets out guidelines for use in air quality assessments.

Defra has produced relevant technical guidance in relation to air quality management - Local Air Quality Management: Technical Guidance LAQM.TG(09)⁵. This document provides useful guidance for use in the assessment of individual developments to ensure that the findings are useful for integration into the local air quality management process.

The Environment Agency's EU Habitats and Birds Directive Handbook provides guidance to Environment Agency inspectors for carrying out a screening assessment, and (if required) an "appropriate assessment" of effects on European designated habitat sites.

The Environment Agency guidance for the proposed AD facility with regards to emissions to air is the guidance for combustion activities⁶. The pollutants of concern with regards to emissions to air from the CHP engine were taken from this guidance.

⁴ Environment Agency, H1 Horizontal Guidance Note, H1- H1 Annex F

⁵ Department for Environment Food and Rural Affairs, Local Air Quality Management, Technical Guidance LAQM.TG(09), February 2009

⁶ Standard rules SR2012 No12 Anaerobic digestion facility including use of the resultant biogas Waste Recovery Operation – capacity less than 100 tonnes of waste per day

3 Assessment Methodology and Study Inputs

3.1 Dispersion Modelling Study

The assessment of impacts to air due to the proposed operations was undertaken using detailed dispersion modelling to predict ground level concentrations of released substances in the vicinity of the site. As set out in Environment Agency guidance⁷, the emissions to air of interest are NO_x, SO₂, VOC and CO.

Information on emissions from the plant was combined with information on meteorological conditions. A dispersion model was then used to predict the concentrations which would arise in the vicinity of the plant due to these emissions. A current industry standard atmospheric dispersion model (ADMS version 5) was used to carry out the modelling.

A summary of the dispersion modelling procedure is as follows (details of the methodology, study inputs and assumptions used for the modelling assessment are provided in Section 3.3 and following below):

- Information on plant location, plant emission characteristics and building layout was obtained from ET Biogas Ventures Ltd and their contractors.
- Appropriate meteorological data recorded at Wittering weather station.
- Ground level concentrations were calculated on a grid of receptor points. This grid extended 750 metres in each cardinal direction from the site. Concentrations were calculated at 15m intervals on this grid. As well as this, levels of released substances were calculated at specific sensitive locations in the vicinity of the proposed AD facility. These locations are discussed further in Section 3.3, and are shown in Figure 1.
- The above information was entered into the dispersion model, which was run to provide the PC (Process Contribution) at each grid point and sensitive receptor location. The PC is the estimated environmental concentration of substances due to releases from the process alone. The results of the assessment of combustion emissions were based upon the highest value identified at any of the sensitive locations, in line with the assessment requirements of European Directive 2008/50/EC. The post processing of the results files produced by ADMS 5 was carried out using Microsoft Excel. The maximum PC at any of the sensitive receptors for each substance was then combined with relevant background data where appropriate to provide the PEC (Predicted Environmental Concentration).
- The PECs were then assessed against the appropriate EQS (Environmental Quality Standard) for each substance to determine the nature and extent of any adverse effects. The EQS in this assessment comprised the ambient air quality objectives for NO₂, SO₂, VOC and CO.
- The modelled pollutant concentrations were processed using a widely used plotting package (SURFER version 11) to produce contour plots of the model results. These are provided for illustrative purposes only; assessment of the model results was based on the numerical values at relevant sensitive receptor locations as described above.

3.2 The Dispersion Model

The dispersion modelling study was carried out using ADMS (Atmospheric Dispersion Modelling System) version 5. ADMS is widely accepted as a current industry standard model for dispersion from point sources such as this CHP engine.

This model is able to incorporate the influence of buildings on the dispersion of material released from the source. ADMS is a computer based model of dispersion in the atmosphere of passive, buoyant, or slightly dense, continuous or finite duration releases from single or multiple sources. The development of ADMS was supported by the Environment Agency. A key improvement in ADMS over older models is its use of the most recent scientific understanding of the structure of the atmospheric boundary layer. In the ADMS approach, the boundary layer structure is defined in terms of measurable physical parameters obtained from meteorological readings, which allow for a more realistic representation of

the changing characteristics of dispersion with height. The result is a more accurate and soundly-based prediction of the concentrations of pollutants.

The presence of buildings close to the release point can significantly affect the dispersion of material from a source. This influence can be taken into account by the use of an appropriate module in ADMS. The site buildings may influence the dispersion of emissions from the stacks. It is therefore important that building effects on dispersion are evaluated in detail. This was done using the ADMS buildings module. The effects of terrain on dispersion from the emission points were also evaluated in detail using the ADMS terrain module.

Models of atmospheric dispersion processes are generally more reliable for long period means than short period means. Models are usually more reliable over intermediate distances (100m to 1000m) than very close to the source, or more distant from the source. This reflects the range of data that have been used to compile the models. Where emissions data are less reliable, or averaging periods are shorter, the results are likely to be less accurate.

To acknowledge this potential for variability in dispersion model results, a conservative approach has been adopted throughout the study, as described throughout this section. This means that modelled results are likely to be overestimates rather than under-estimates of the ground level concentrations that will arise in practice.

In summary, ADMS was considered to be the most suitable model for this application for the following reasons:

- Industry standard model for atmospheric dispersion modelling;
- Advanced understanding of boundary layer meteorology; and
- Ability to model the influence of buildings and terrain on dispersion.

3.3 Study inputs

3.3.1 Assessment Criteria

CHP Emissions

The assessment criteria for NO₂, SO₂, CO and VOC used in the study are discussed in Section 1.2 and are set out in Table 1.

A summary of the air quality criteria used in this study are shown in Table 1.

Table 1: Air quality objectives and guidelines relevant to this study

Pollutant	Concentration	Measured as
Carbon monoxide (CO)	10,000 µg/m ³	Maximum daily running 8-hour mean
Nitrogen dioxide 1 hour mean (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times in a year (equivalent to the 99.8th percentile)	1 hour mean
	40 µg/m ³	Annual mean
Oxides of nitrogen	30 µg/m ³ (limit value for the protection of vegetation)	Annual mean
Sulphur dioxide (SO ₂)	125 µg/m ³ not to be exceeded more than 3 times in a year (equivalent to the 99.2nd percentile)	24 hour mean
	350 µg/m ³ not to be exceeded more than 24 times in a year (equivalent to the	1 hour mean

Pollutant	Concentration	Measured as
	99.7th percentile)	
	266 µg/m ³ not to be exceeded more than 35 times in a year (equivalent to the 99.9th percentile)	15 minute mean
	20 µg/m ³ (limit value for the protection of vegetation)	Annual mean
VOC	No objective	

Critical Loads for Deposition at Habitat Sites

Estimated critical loads for statutory designated habitat sites in the UK have been published by the Centre for Ecology and Hydrology (CEH) and are available from the UK Air Pollution Information System (APIS)⁷. Critical Loads are defined on the APIS website as:

"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge."

Compliance with these benchmarks is likely to result in no significant adverse effects on the natural environment at these locations. The estimated critical loads for the designated habitat sites are set out in Table 2. Details of the habitat sites/locations included in this assessment are provided in Table 4..

The selection of the critical load for each habitat site was based on initially utilising the Site Relevant Critical Load (SRCL) function on the APIS website. In many cases, as the designated features for the nearby habitat sites were based on open water or water features, no critical loads are available. In these cases, the Search By Location (SBL) function was used to determine the critical loads for the specific assessment locations within each habitat and the specific habitat features were required to be selected on the APIS website.

Table 2: Critical load value for deposition of acids and nutrient nitrogen

Designated site name	Acid (kEqH ⁺ /ha/year)	Nutrient nitrogen (kgN/ha/year) (Min)	Habitat feature
Neau Washes	1.37	20	Neutral Grassland,
kEqH ⁺ /ha-year: kilo-equivalents hydrogen ion per hectare per year kgN/ha-year: kilograms of nitrogen per hectare per year Unless otherwise stated, acid critical load (CL) is the sum of CLmaxS and CLminN. Nitrogen critical load is the minimum of the reported range. * = Value is listed on APIS as the total acid critical load and not given as CLmaxS, CLminN and CLmaxN.			

Emissions Data

The emissions data for the CHP unit was provided by ET Biogas Ventures Ltd and its associated technology provider.

⁷ UK Air Pollution Information System, <http://www.apis.ac.uk/index.html>

Emissions from the CHP units were based on the limits for CHP emission set out in Standard rules SR2012 No12. The emissions data and characteristics of the CHP unit are presented in Table 3. **Table 3.**

Table 3: Emissions data for the CHP engine stack

Aspect		Unit	Value
Stack location		-	525030, 325252
Stack height		M	9, 12, & 15
Volumetric flow		Am ³ /hr	3,384
		Nm ³ /hr	2105
Efflux velocity		m/s	15
Efflux temperature		°C	180
Concentration	NOx	mg/Nm ³	500
	SO ₂		350
	VOC		1000
	CO		1400
Mass emission	NOx	g/s	0.29
	SO ₂		0.20
	VOC		0.58
	CO		0.81

Hours of Operation

For the purposes of the modelling study it was assumed that the CHP plant operate at 100% load continuously for the entire year.

Sensitive Receptors

Sensitive receptors include members of the public who may be exposed to releases arising from the operation of the proposed facility. Exposure is normally considered at locations such as domestic dwellings, hospitals and schools. A number of potentially sensitive receptors have been identified in close proximity to the plant and concentrations of each substance were predicted at these locations. The sensitive receptors are shown in Table 4 and Figure 1. The sensitive receptors considered also include a receptor to represent a nearby nature reserve.

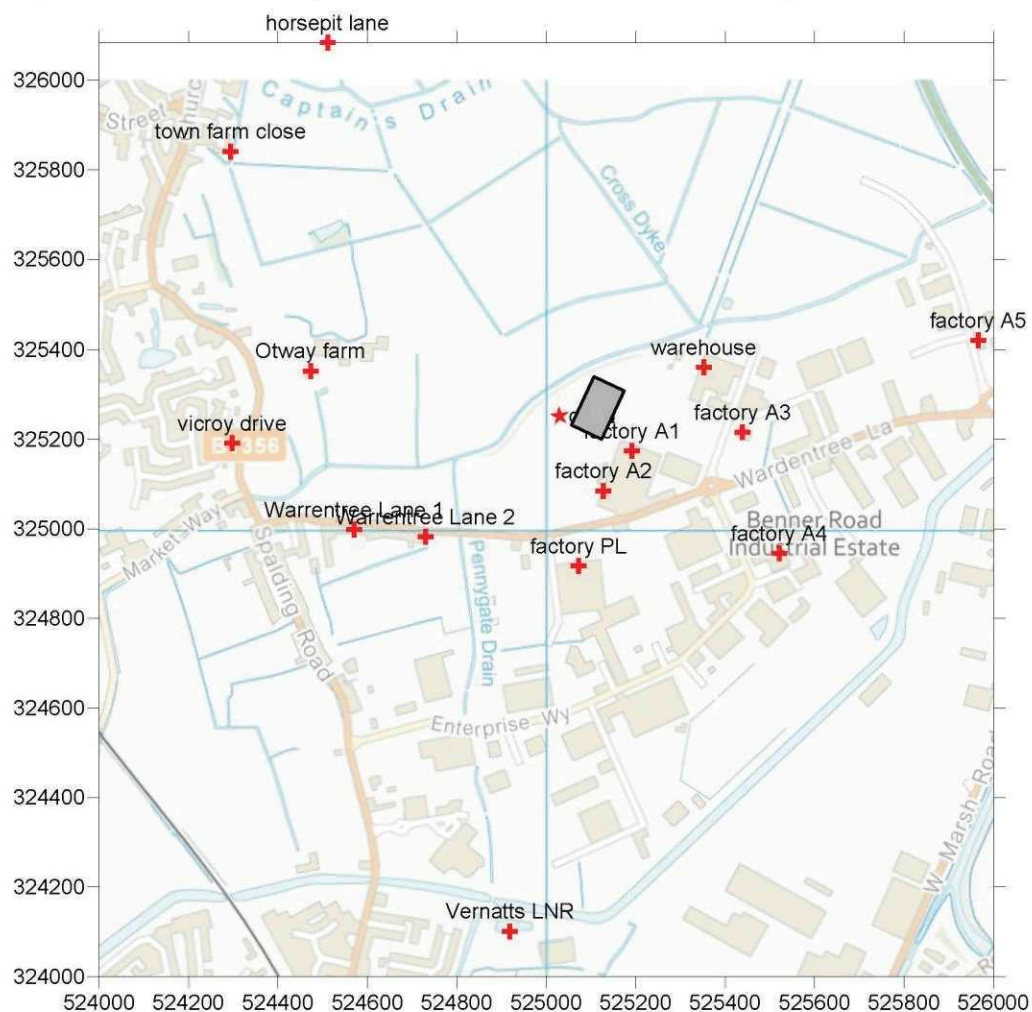
A receptor grid with dimensions 1.5km x 1.5km was also set up to cover the area surrounding the proposed site. The grid spacing was 15m.

Table 4: Sensitive receptor locations considered in this study

Location	Easting	Northing
Horsepit Lane	524511	326084
Town Farm Close	524294	325841
Otway Farm	524473	325353
Vicroy Drive	524298	325191
Warrentree Lane 1	524571	324998
Warrentree Lane 2	524730	324982
Warehouse	525352	325361

Factory A1	525192	325174
Factory A2	525128	325085
Factory PL	525072	324917
Vernatts LNR	524919	324101
Factory A3	525439	325216
Factory A4	525521	324945
Factory A5	525966	325421

Figure 1: Sensitive receptor locations considered in this study



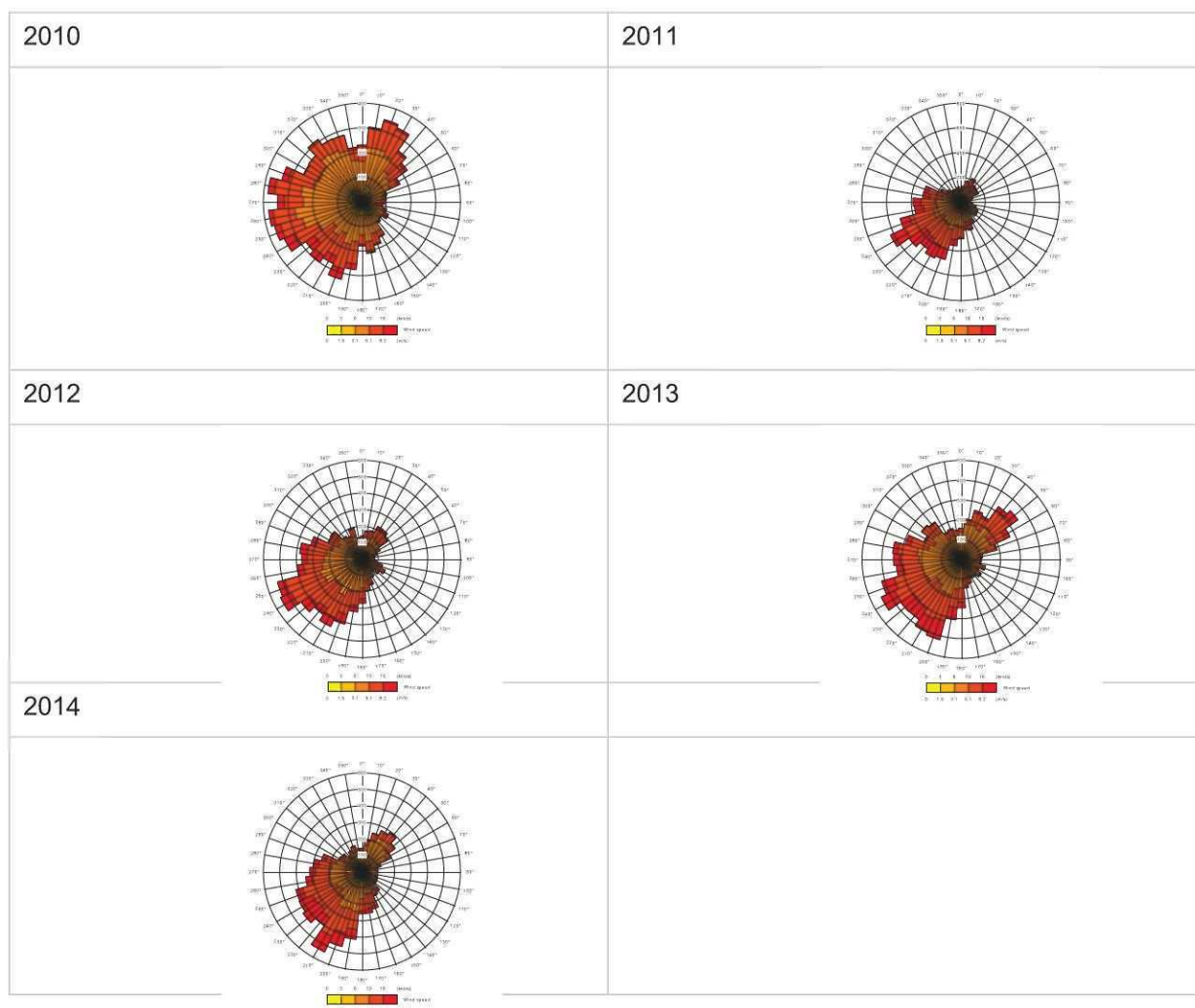
Meteorological Data

The most appropriate meteorological station is the RAF Wittering weather station. This station is approximately 28km to the south west of the site. Five years of hourly sequential data recorded from 2010 – 2014 were used for the study. It has been assumed that the data are representative of conditions at the site. The wind roses for each year of meteorological data utilised in the assessment are shown in Figure 2.

Meteorological data was sourced from the NOAA surface observations archive and processed into hourly sequential ADMS format. Data filling was carried out where necessary according to the methodology provided by the USEPA in their "Meteorological Monitoring Guidance for Regulatory Modeling Applications" guidance document. The recommended filling procedure is based on the persistence method- this is where a missing value is replaced by the use of data from the previous

hour(s). Missing cloud cover data is quite common in meteorological data sets though on this occasion after filling the data capture is good, i.e. >90%DC for all meteorological parameters.

Figure 2: Windrose for RAF Wittering 2010-2014



Terrain

Changes in topography in the vicinity of the site could potentially have an effect upon dispersion of pollutants. This is only likely to be significant in areas where large-scale slopes exceed a gradient of 1:10. A review of Ordnance Survey mapping of the local area indicates that the terrain is relatively flat. Therefore, the main modelling assessment was carried out without using the terrain module in ADMS.

Buildings

The dispersion of substances released from elevated point sources such as the CHP stack at the site may be influenced by the presence of buildings close to the source. The buildings can interrupt the wind flows with the potential to give higher ground-level concentrations close to the source than would arise in the absence of the buildings.

The influence of the site buildings on dispersion was taken into account in this study by using the "Buildings" module of the dispersion model. The site layout was taken from site plans provided by ET Biogas Ventures Ltd. The building likely to have the most significant effect on dispersion will be the tallest one located closest to the release points. For the purpose of this study the main buildings on site have been combined to reflect a single structure, the details of which is summarised in Table 5.

Table 5: Details of significant buildings

Name	OS coordinates	Height (m)	Length (m)	Width (m)	Angle length north	of to
Site building	525115,325270	18	120	75	25	

Surface Roughness

The surface roughness is a length scale used to represent the turbulent effect of obstructions in the surrounding area. As the land surrounding the site is a mix of suburban and open land, a single surface roughness value for the assessment location of 0.3m was used.

Conservative Assumptions

The conservative assumptions adopted in this study to ensure that predictions are more likely to be over-estimates than under-estimates are summarised below:

- It was assumed that all CHP plant were in continuous maximum operation for the whole year;
- It was assumed that 70% of NO_x emitted from the plant will be converted to NO₂ at ground level in the vicinity of the plant for determination of the annual mean. It was assumed that 35% of NO_x will be converted to NO₂ for determination of the short term concentrations. The actual conversion to nitrogen dioxide is likely to be less than this;
- The highest predicted concentration at any off-site receptor location was used in the assessment of environmental effects. Concentrations at locations further away are likely to be less than the maximum values presented; and
- The highest predicted concentrations obtained using any of the five different years of meteorological data have been used in this assessment. During a typical year the ground level concentrations would be lower.

4 Baseline condition

The background pollution climate is assessed in this section by reference to national estimates of background pollution concentrations. The background concentrations relevant to this study are summarised in Table 6.

Table 6: Predicted ambient pollutant concentrations around the application site⁸

X	Y	NO ₂ (µg/m ³)	NO _x (µg/m ³)	SO ₂ (µg/m ³)	Benzene (µg/m ³)	CO (mg/m ³)
524500	324500	10.8	14.8	2.99	0.229	0.258
524500	325500	11.8	16.2	3.2	0.206	0.25
524500	326500	11.2	15.4	2.67	0.193	0.244
525500	324500	11.4	15.6	3.31	0.231	0.259
525500	325500	14.2	20.0	2.73	0.208	0.251
525500	326500	13.5	18.9	2.48	0.195	0.245
526500	324500	11.9	16.4	2.96	0.216	0.256
526500	325500	19.9	29.7	2.61	0.199	0.25
526500	326500	14.4	20.2	3.17	0.187	0.244

For the purpose of illustrating the background situation at local nature reserve has been extracted for 524500,324500 . At this location the following background estimates are given:

- Acid deposition 1.37 and 0.2 keq/ha/yr for nitrogen and sulphur respectively
- Nitrogen deposition 19.18 kg N/ha/yr
- Sulphur dioxide: 1.87 µg/m³

⁸ <http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011>

5 Impact assessment and results

5.1 Sensitive receptors

The results of the dispersion modelling from the CHP engine are set out in Table 7. The results are based on the maximum concentrations at the specific receptor for any of the five years of meteorological data used in the study. Throughout the study, these and other conservative assumptions have been used to ensure that any impacts are more likely to be over-estimated than under-estimated. These assumptions and the other main study inputs are detailed in Section 3 of this report.

Table 7 also presents the maximum concentration at the location of greatest impact. The results are presented for each stack height considered (9m, 12m, and 15m).

Plots have been prepared to illustrate the location at which the maximum impact is likely to occur for the range of stack heights considered. Figures show the forecast contribution of nitrogen dioxide to the annual average ambient concentration, and show the forecast contribution of nitrogen dioxide to the 99.97th percentile of 1 hour average ambient concentration. The impact for stack heights of 9m, 12m, and 15m are shown in Figures 3, 4, and 5, respectively.

The impact assessment shown in Table 8 presents the analysis for the maximum point of impact based on a stack height of 12m. The illustrations presented in Figures 3 -5 show that the point of maximum impact lies close to the CHP unit towards the south west boundary of the site. This location is either within or close to the site boundary where no members of the public are likely to have access.

The process contributions at the closest residential properties are considerably lower as illustrated in Table 8. Thus at the closest residential property, the short and long term National Air Quality Strategy Objectives would not be exceeded by the CHP operations.

Table 7: Process contributions at specific receptor locations considered in this study

Location	NO ₂		SO ₂				CO	VOC
	Annual average	99.79 th ile 1-hour	Annual average	99.2 th %ile 24hour	99.7 th ile – 1 hour	99.9 th ile 15 minute	100 th ile	Annual average
Max – with 9m stack	11.9	124.1	11.9	122.8	247.1	253.6	0.9	34.1
Max – with 12m stack	6.4	66.5	6.4	46.2	113.1	140.9	0.5	18.3
Max – with 15m stack	4.1	20.8	4.1	24.2	41.4	57.6	0.2	11.9
	Impact predictions based on 12m stack height							
Horsepit lane	0.04	1.2	0.04	0.7	2.2	4.7	7	0.1
Town farm close	0.04	1.2	0.04	0.8	3.5	7.0	14	0.1
Otway farm	0.05	1.9	0.05	1.1	4.4	8.5	18	0.1
Vicroy drive	0.03	1.7	0.03	0.6	3.4	6.3	12	0.1
Warrentree Lane 1	0.10	2.1	0.10	1.6	5.1	10.2	21	0.3
Warrentree Lane 2	0.15	2.3	0.15	2.1	6.6	13.8	26	0.4
Warehouse	0.53	3.9	0.53	2.9	9.2	33.3	33	1.5
Factory A1	0.57	6.8	0.57	8.7	18.7	23.1	65	1.6
Factory A2	0.36	4.4	0.36	7.4	12.4	14.4	45	1.0
Factory PL	0.22	2.9	0.22	3.6	7.0	9.0	25	0.6
Vernatts LNR	0.05	0.9	0.05	0.7	1.9	2.5	9	0.1
Factory A3	0.31	2.7	0.31	2.2	8.1	18.7	28	0.9
Factory A4	0.11	1.7	0.11	0.9	4.7	10.5	16	0.3
Factory A5	0.08	1.1	0.08	0.8	4.7	9.2	10	0.2

Figure 3a: Predicted contributions to annual average nitrogen dioxide concentrations, ($\mu\text{g m}^{-3}$) for a 9m high stack

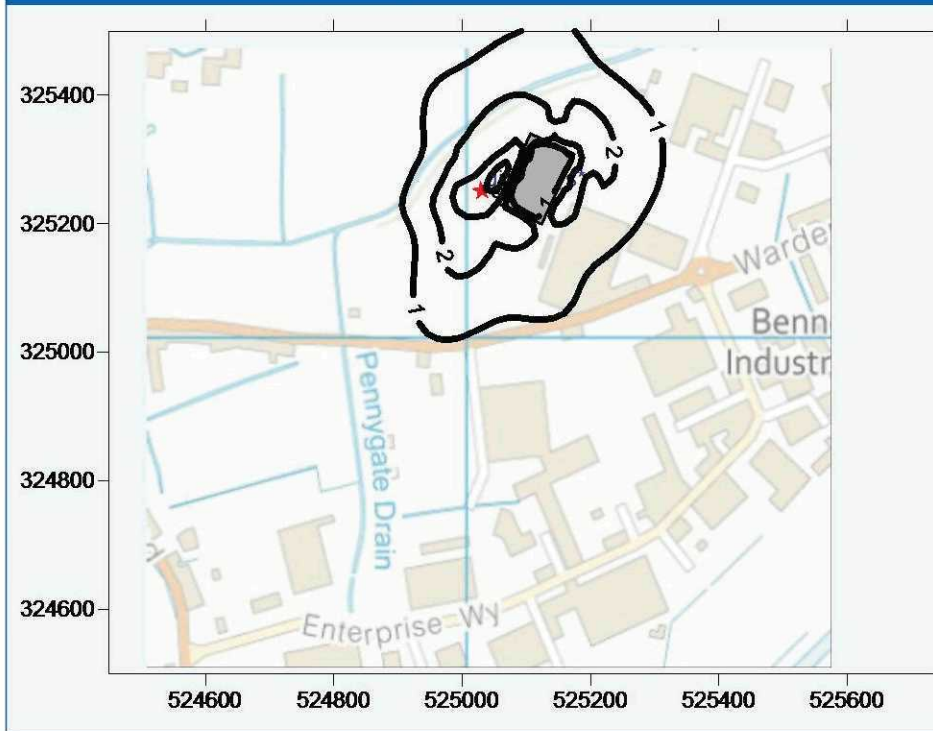


Figure 3b: Predicted contributions to 99.79th percentile average nitrogen dioxide concentrations ($\mu\text{g/m}^3$) for a 9m high stack

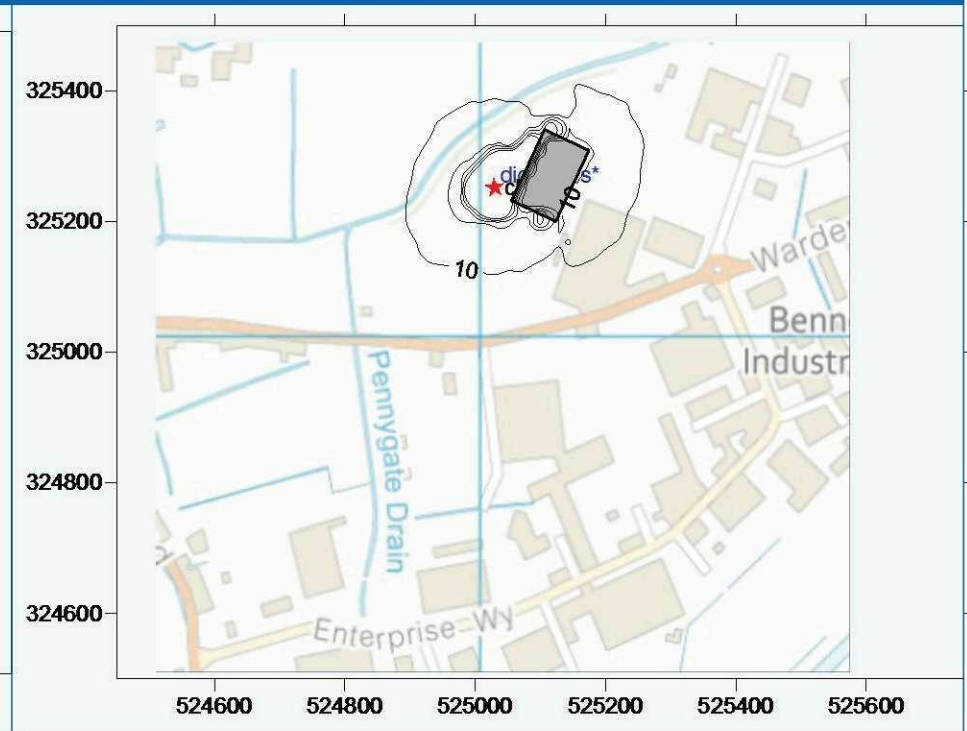


Figure 4a: Predicted contributions to annual average nitrogen dioxide concentrations, ($\mu\text{g m}^{-3}$) for a 12m high stack

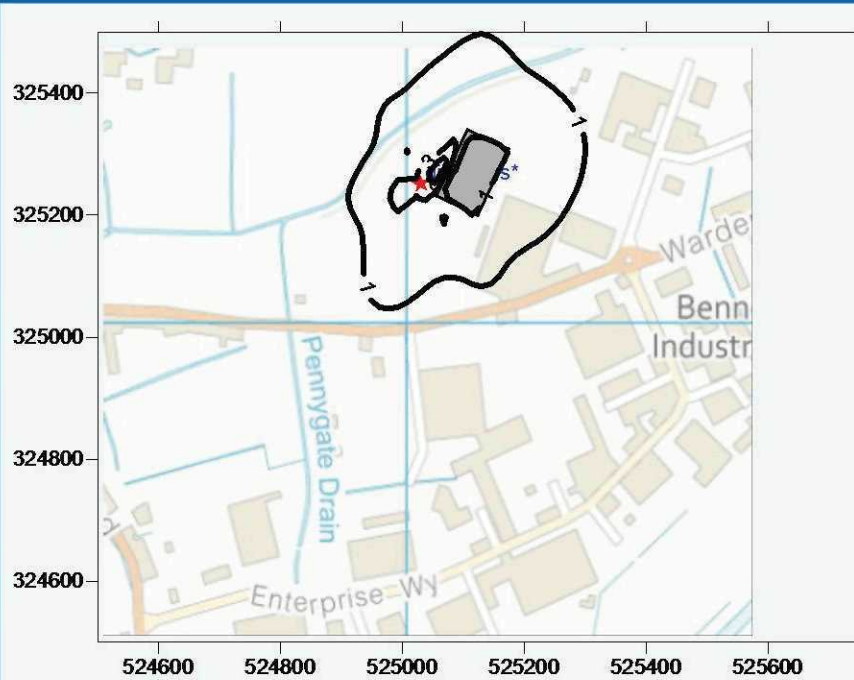


Figure 4b: Predicted contributions to 99.79th percentile average nitrogen dioxide concentrations ($\mu\text{g/m}^3$) for a 12m high stack

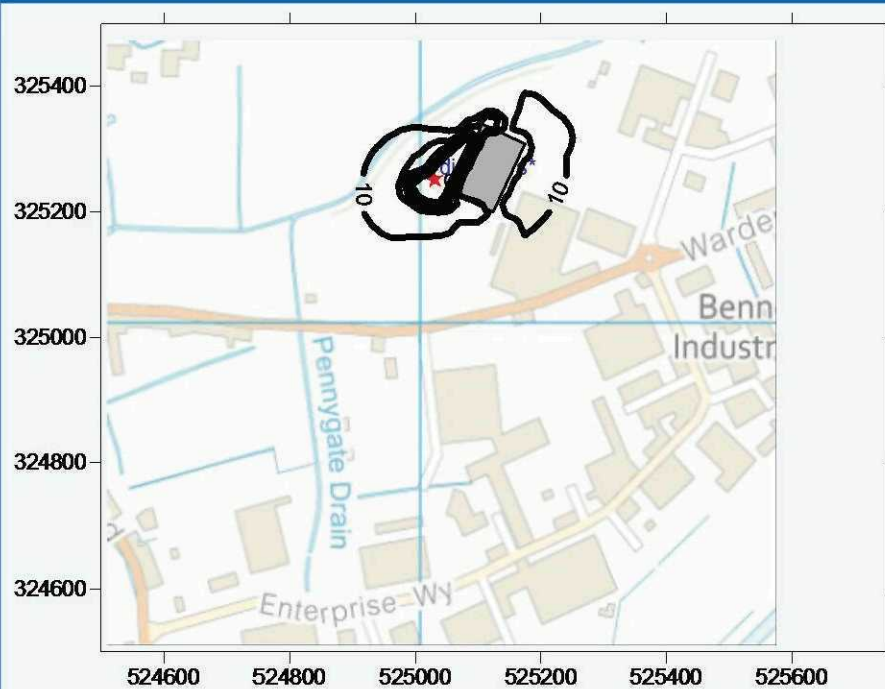


Figure 5b: Predicted contributions to 99.79thile average nitrogen dioxide concentrations ($\mu\text{g}/\text{m}^3$) for a 15m high stack

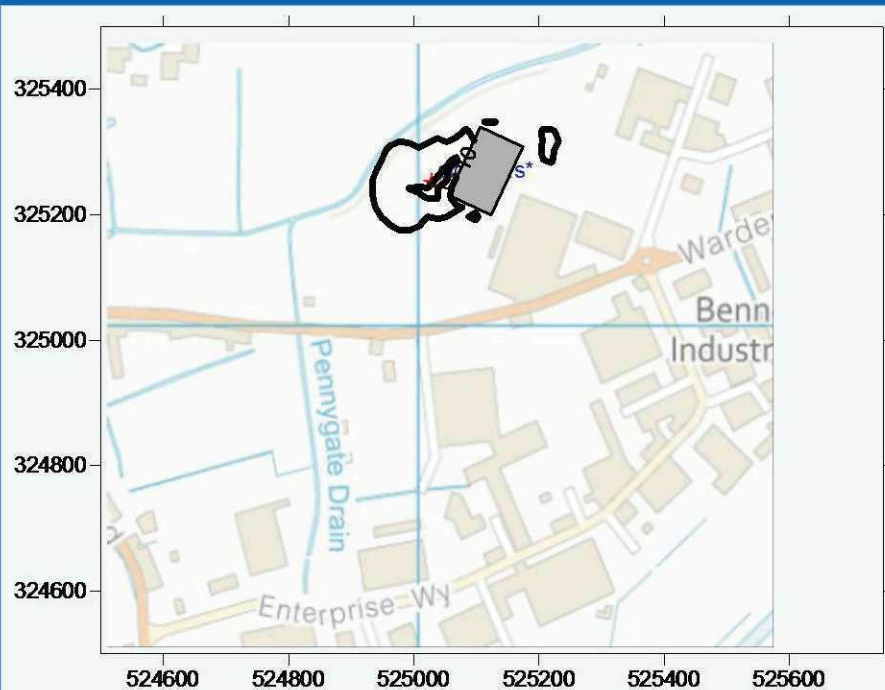


Table 8: Results of dispersion modelling at sensitive human receptor locations based on a stack height of 12m above the surrounding ground level

Substance		Stack height	EQS ($\mu\text{g}/\text{m}^3$)	Background ($\mu\text{g}/\text{m}^3$)	PC ($\mu\text{g}/\text{m}^3$)	PC/EQS (%)	PC ($\mu\text{g}/\text{m}^3$)	PC/EQS (%)
NO ₂	Annual mean	9m	40	14.2	11.9	30%	26.1	65%
		12m			6.4	16%	20.6	52%
		15m			4.1	10%	18.3	46%
	99.8 th %ile of 1-hr mean concentrations	9m	200	28.2	124.1	62%	152.3	76%
		12m			66.5	33%	94.70	47%
		15m			20.8	10%	49	25%
	99.9 th %ile of 15-min mean concentrations	9m	266	2.73	253.6	95%	256.33	96%
		12m			140.9	53%	143.63	54%
		15m			57.6	22%	60.33	23%
SO ₂	99.7 %ile of 1-hr mean concentrations	9m	350	2.73	247.1	71%	249.83	71%
		12m			113.1	32%	115.83	33%
		15m			41.4	12%	44.13	13%
	99.2 nd %ile of 24-hr mean concentrations	9m	125	2.73	122.8	98%	125.53	100%
		12m			46.2	37%	48.93	39%
		15m			24.2	19%	26.93	22%
CO	100 th %ile of 8-hr rolling mean concentrations	9m	10000	251	900	9%	1151	12%
		12m			500	5%	751	8%
		15m			200	2%	451	5%
VOC	Annual mean	9m	No value		34.1			
		12m			18.3			
		15m			11.9			

5.2 Habitat assessment

There are no European designated sites within 10 km of the proposed development site, the screening distance set out in EA guidance⁴. There is one locally designated nature reserve within 2 km of the proposed development site.

Air concentrations of nitrogen and sulphur have been investigated at Vernatts LNR to ensure that the application site would have no significant effects at habitat sites.

The assessment of deposition at this habitat site was carried out in accordance with recently published relevant guidance. Environment Agency guidance for habitats assessment was adopted for the purpose of this study.⁹ In accordance with this guidance, the following deposition velocities were assumed for the study:

Table 9: Deposition velocities

Substance	Deposition velocities (m/s)	
	Grassland	Woodland
Nitrogen dioxide	0.0015	0.003
Sulphur dioxide	0.012	0.024

Table 10 presents the predicted levels and loads for nitrogen oxides (as NO₂) and nitrogen at the nine locations considered in the modelling. The results show that:

- The process contribution to the annual average nitrogen oxides level is predicted to be less than 1% of the 30 µg/m³ threshold. This impact level is considered to be insignificant.
- The process contribution to the 24 hour nitrogen oxides level is predicted to be less than 10% of the 75 µg/m³ threshold. This impact level is considered to be insignificant.
- The process contribution to the annual average nitrogen load is predicted to be less than 1% of the 15 kgN/ha/yr threshold. This impact level is considered to be insignificant.

Table 11 presents the predicted levels for sulphur dioxide at the nine locations considered in the modelling. The results show that:

- The process contribution to the annual average sulphur dioxide level is predicted to be less than 1% of the 20 µg/m³ threshold. This impact level is considered to be insignificant.

The impact assessment for acid deposition has been carried out using the methodology provided by APIS¹⁰. This states that where the predicted environmental concentration is greater than CLminN, the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.

Thus where $PEC\ N\ Deposition > CLminN$, PC as %CL function = $((PC\ of\ S+N\ deposition)/CLmaxN)*100$. The process contribution at the nature reserve will therefore be: $(0.0005+0.0006)/1.37*100 = 0.10\%$. This impact level is considered to be insignificant.

⁹ Environment Agency, "Habitats Directive – Environment Agency policy," Appendix 7 "Stage 1 and 2 Assessment of new PIR permissions under the Habitats Regulations," issued 30 January 2009. Environment Agency, "Habitats Directive: taking a new permission, plan or project through the regulations," issued 10 August 2010

¹⁰ <http://www.apis.ac.uk/clf-guidance>

Table 10: Process contribution of nitrogen compounds at the nearest nature reserve

Location	Nitrogen oxides (as NO ₂) Annual Average (µg/m ³)	% of 30 µg/m ³ threshold	Nitrogen oxides (as NO ₂) 24 hour Average (µg/m ³)	% of 75 µg/m ³ threshold	N deposition (kg N/ha/yr)	% of 15 kg N/ha/yr threshold	Acid deposition (keq/ha/yr)
Vernatts LNR	0.05	0.17%	2.18	2.90%	0.0072	0.05%	0.0005

Table 11 Process contribution of sulphur compounds at the nearest nature reserve

Location	Sulphur dioxide Annual average (µg/m ³)	% of 20 µg/m ³ threshold	Sulphur deposition (kg S/ha/yr)	Acid deposition (keq/ha/yr)
Vernatts LNR	0.05	0.25%	0.009	0.0006

6 Conclusion

This study considers a worst case operating scenario associated with the operation the CHP plant.

The assessment shows that:

- The National Air Quality Strategy objectives for sulphur dioxide could be exceeded at the point of maximum impact. However, this location is on land under the ownership of the applicant or is a location where people would not have access.
- The National Air Quality Strategy objective and guidelines would not be exceeded at the closest residential receptor or any location where public exposure could occur over the relevant averaging period.
- Process contribution to the nitrogen and sulphur levels and loads at Vernatts LNR is not significant.

It is recommended that the CHP stack should be 12m above the surrounding ground level.

RICARDO-AEA

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000

e: enquiry@ricardo-aea.com

www.ricardo-aea.com