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Air Quality Assessment – Environmental Permit

Land at Ellough Road, Beccles

V.C. Cooke Limited

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'Experience and expertise working in union'

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Air Quality Assessment – Environmental Permit

Project:	Small-Scale Energy Recovery Facility
For:	V.C. Cooke Limited
Status:	**Issue**
Date:	August 2023
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Reviewer:	Josh Davies

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Non-Technical Summary

i. Enzygo Limited was commissioned by V.C. Cooke Limited to undertake an Air Quality Assessment in support of a Small Waste Incineration Plant permit application for a to be located at Land at Ellough Road, Beccles.

ii. The produced heat and power will be utilised by units within the adjacent industrial estate, supporting its sustainable expansion as allocated by the Local Plan.

iii. Pollutant emissions associated with the combustion of the waste materials have the potential to cause impacts at sensitive locations within the vicinity of the site. As such, an Air Quality Assessment has been undertaken to assess the significance of these impacts.

iv. Operational impacts were predicted based on the plant operating continuously and at the maximum permissible limits. As such, predicted concentrations are considered to be assessed robustly. The impacts were assessed against Environmental Agency guidance criteria for permitting.

v. The dispersion modelling results indicated that impacts upon at human and ecological sensitive receptors were predicted to be not significant for all pollutants and criteria.

vi. The re-assessment of SO_2 concentrations against the more stringent critical level remained not significant at all designations.

vii. The in-combination ecological assessment showed that the screening threshold were exceeded by other developments alone and not as a direct result of the Proposed Development. In such circumstances the focus should be on the potentially significant impacts individually and the in-combination assessment does not indicate that impacts from the Proposed Development can be considered as significant.

viii. In addition, the Proposed Development is based on permitted emission limits and actual emissions are likely to be lower than those assessed in this report.

ix. Based on the predictions and the use of robust assumptions, it is considered that the proposals are therefore considered acceptable.

1.0 Introduction

1.1 Background

1.1.1 Enzygo Limited was commissioned by V.C. Cooke Limited to undertake an Air Quality Assessment in support of the Environmental Permit (EP) application for a Small Waste Incineration Plant (SWIP) to be located at Land at Ellough Road, Beccles, NR34 7TQ.

1.1.2 Works will principally involve the external addition of a singular 36m flue stack, with the ERF equipment located within an existing building on site. No works to enlarge the host building are required.

1.1.3 Enzygo understands that the proposed development would be located within an existing consented Materials Recycling Facility (MRF), however, as the building has no existing consent for thermal combustion, the EP application seeks to gain consent for the operation with an electrical output of 2.5 MWe and a thermal output of 10 MWe. The combined heat and power will be utilised by units within the adjacent industrial estate, supporting its sustainable expansion as allocated by the Local Plan.

1.1.4 It is proposed that the plant will operate 24/7 with a maximum throughput of 2.89 tonnes per hour with the exception of shutdown periods for plant maintenance.

1.1.5 Emissions from the operation of the facility has the potential to increase air pollutant concentrations in the vicinity of the site and an assessment is required to quantify the significance of impacts upon sensitive human and ecological receptors.

1.1.6 The are some revisions from the AQA provided in the planning permission in that, based on information provided for the engine (Appendix A), a very slightly revised flow rate has been used (negligible change in emissions). In addition since the previous assessment there have been updates in nitrogen critical loads and ecological baseline levels and, as such, the changes have been incorporated into this assessment.

1.1.7 The site will be managed by V.C. Cooke Limited, hereby referred to as the 'Operator'.

1.2 Site Location and Context

1.2.1 The proposed development is located at approximate National Grid Reference (NGR): 644120 288390. The proposed site is located in an existing industrial area however it is predominantly surrounded by rural/agricultural land use.

1.2.2 The site is located within East Suffolk Council's (ESC) area of administration and set within an existing industrial estate earmarked for expansion. The growing number of industrial users in the estate will mean that demand for low carbon heat and electricity will increase. The proposed development will not only deliver a more sustainable solution to current on-site waste management, but will provide low carbon heat and power to existing and future operators within the estate.

1.2.3 The A145 Benacre Road is located approximately 20 m from the site entrance. The closest receptors are the industrial units surrounding the site and the nearest residential receptor 630 m west of the site boundary. The nearest concentration of residential properties is the town of Beccles, its outskirts being located approximately 1 km from the site.

1.2.4 The Beccles and Worlingham Garden Neighbourhood allocation site (WLP3.1) is located to the north-west of the proposed development site.

1.2.5 Local and statutory ecological sites are located within relevant screening distances specified by the Environment Agency.

1.2.6 Reference should be made to Figure 1 (below) for reference to the site location and surrounding environment. Modelled receptor locations can be found in Figure 2 and Figure 3.

Figure 1 – Site Location

1.3 Limitations

1.3.1 This report has been produced in accordance with Enzygo's standard terms of engagement. Enzygo has prepared this report solely for the use of the Client (for EP submission) and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Enzygo; a charge may be levied against such approval.

2.0 Legislation Guidance and Policy

2.1.1 The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- The Air Quality Standards (Amendment) Regulations, updated on 31st December 2016[1];
- Part IV of the Environment Act (1995);
- Local Air Quality Management Technical Guidance 2022 LAQM (TG22), DEFRA, 2022[2];
- Air emissions risk assessment for your environmental permit, Environment Agency (EA), updated on 7th October 2020[3];
- Environmental permitting: air dispersion modelling reports, EA, updated on 24th May 2019[4]; and
- Environmental permitting technical guidance PG13/1(20) - Reference document for the operation of small waste incineration plants (SWIPs)[5].

2.2 UK Legislation

2.2.1 The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives, and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 20071. The AQS sets out Air Quality Objectives (AQOs) that 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 compliance vary slightly.

2.2.3 The annual and hour limits set out in Table 1 and Table 2 are specified as AQOs, Environmental Assessment Levels (EALs) or Ambient Air Directive (AAD) for ease these criteria are collectively referred to as Environmental Quality Standards (EQSs) throughout the assessment.

2.2.4 Table 1 presents the EQS for pollutants considered within this assessment.

[1] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007
[2] Local Air Quality Management Technical Guidance 2022 (LAQM.TG22), DEFRA, August 2022.
[3] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
[4] https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports
[5] Environmental permitting technical guidance PG13/1(20) Reference document for the operation of small waste incineration plants (SWIPs). Environment Agency, 2020.

Table 1 Air Quality Limit Values and Objectives

Pollutant	Air Quality Objectives	
	Concentration (µg/m³)	Averaging Periods
Nitrogen dioxide (NO_2)	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year
Particulate matter with an aerodynamic diameter of less than 10µm (PM_{10})	40	Annual mean
	50	24-hour mean; not to be exceeded more than 35 times a year
Particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$)	25	Annual mean
Carbon monoxide (CO)	10,000	8-hour running mean
Total Organic Carbon (TOC) as Benzene (C_6H_6)	5	Annual mean
	30	24-hour mean
Sulphur dioxide (SO_2)	125	24-hour mean; not to be exceeded more than 3 times a year
	350	1-hour mean; not to be exceeded more than 24 times a year
	266	15-minute mean; not to be exceeded more than 35 times a year
Hydrogen Chloride (HCl)	750	1-hour mean
Hydrogen Fluoride (HF)	16	Monthly Mean
	160	1-hour mean
Polycyclic Aromatic Hydrocarbons (PAH)	0.00025	Annual mean
Lead (Pb)	0.25	Annual mean
Pollutant	**Concentration (ng/m³)**	**Averaging Periods**
Arsenic (As)	6	Annual mean
Cadmium (Cd)	5	Annual mean
Nickel (Ni)	20	Annual mean

2.2.5 Target values and EALs for mercury (Hg), antimony (Sb), chromium (Cr), copper (Cu), vanadium (V), and manganese (Mn) are summarised in Table 2.

Table 2 Environmental Assessment Levels

Pollutant	Environmental Assessment Levels (µg/m³)	
	Annual Limit	Hourly Limit
Cr	0.00025[a]	150[b]
Cu	10	100
Hg	0.25	7.5
Sb	5	150
Mn	0.15	1500
V	5	1

Notes:
a: Based on the Cr VI EAL
b: Based on the Cr III EAL

2.2.6 It should be noted that there are currently no AQOs, AQTVs and EALs for thallium (TI) and cobalt (Co). Therefore, these pollutants have not been considered further within the context of this assessment. There is also no EQS for Dioxins and Furans (PCDD/Fs) and as such the assessment is based on the tolerable daily intake recommended by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment as detailed in Table 3.

Table 3 Tolerable Daily Intake for Dioxins and Furans

Pollutant	Daily Tolerable Intake (fg/m³)
PCDD/Fs	2000

2.2.7 Table 4 summarises the advice provided in the DEFRA guidance LAQM (TG22)[2] on where the EQS for pollutants considered within this report apply.

Table 4 Examples of Where the Air Quality Objectives Should Apply

Averaging Period	Objectives Should Apply At	Objectives 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 facades 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
24-hour and 8 hour mean	As above together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term
1-hour mean	As above, and kerbside sites (for example, pavements of busy shopping streets) 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 are expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes	

2.3 Ecological Critical Loads and Levels

2.3.1 Impacts on ecological designations will be assessed in accordance with the EA guidance[3]. Critical loads and levels (CLs) have been designated based on the sensitivity of the receiving habitat.

2.3.2 Table 5 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 5 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration (µg/m³)	Averaging Periods
Oxides of Nitrogen (NO_x)	30	Annual mean
	75	24-hour mean
SO_2	20	Annual mean
	10 (Lichens or Bryophytes present)	Annual mean
HF	5	Daily mean
	0.5	Weekly mean
Nutrient Nitrogen Deposition	Site Specific (See Section 4.7)	Annual mean
Acid Nitrogen Deposition	Site Specific (See Section 4.7)	Annual mean

2.3.3 The significance of impacts will be compared against the relevant critical loads and levels obtained from the UK Air Pollution Information System (APIS)[6].

[6] http://www.apis.ac.uk/

3.0 Methodology

3.1 Stack Emissions Assessment

3.1.1 Emissions associated with the proposed facility have the potential to cause increases in pollutant concentrations in the vicinity of the site.

3.1.2 To quantify the process contribution, dispersion modelling was undertaken using ADMS 5 (v5.2.4.0), which is a short-range dispersion modelling software package developed by Cambridge Environmental Research Consultants (CERC). The model simulates a wide range of buoyant and passive releases to atmosphere. 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.

3.1.3 The dispersion modelling procedure was as follows:

- Information on stack dimensions and position were provided by V.C. Cooke Limited;
- Process conditions were provided by V.C. Cooke Limited;
- Emission rates were based on the 'Environmental permitting technical guidance PG13/1(20) - Reference document for the operation of small waste incineration plants (SWIPs)' emission limits; and
- Appropriate data to describe meteorological conditions in the vicinity of the site were obtained from Atmospheric Dispersion Modelling (ADM) Ltd.

3.1.4 The above information was entered into ADMS 5.2 and processed to determine pollutant concentrations in the vicinity of the site. Results are then compared against the relevant EQS's and assessment criteria to determine impact significance.

3.1.5 Modelling predictions produced by the ADMS-5 are widely accepted by local authorities, the EA and DEFRA.

3.2 Modelling Scenarios

3.2.1 The modelled pollutant scenarios considered in the modelling assessment are summarised in Table 6.

Table 6 Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Short Term	Long Term
NO_2	99.79th percentile (%ile) 1-hour mean	Annual mean
NO_x	24-hour mean	Annual mean
PM_{10}	90.41%ile 24-hour mean	Annual mean
$PM_{2.5}$	-	Annual mean
CO	8-hour rolling mean	-
TOC as Benzene	-	Annual mean
SO_2	99.9%ile 15-minute mean	Annual mean
	99.73%ile 1-hour mean	
	99.18%ile 24-hour mean	

Pollutant	Modelled As	
	Short Term	Long Term
HCl	1-hour mean	-
HF	1-hour mean	Annual mean
	24-hour mean	
	7-day mean	
PCDD/Fs	1-hour mean	Annual mean
Pb	-	Annual mean
As	-	Annual mean
Cd	-	Annual mean
Ni	-	Annual mean
Hg	1-hour mean	Annual mean
Sb	1-hour mean	Annual mean
Cr	1-hour mean	Annual mean
Cu	1-hour mean	Annual mean
Mn	1-hour mean	Annual mean
V	1-hour mean	Annual mean
Nitrogen deposition	-	Annual deposition
Acid deposition	-	Annual deposition

3.2.2 Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the percentiles (%ile) shown in Table 9.6 were selected to represent the relationship between the permitted number of exceedances of short-period concentrations and the number of periods within a calendar year.

3.2.3 For the purposes of dispersion modelling it was considered that the entire particulate matter (PM) emission consisted of only PM_{10} or $PM_{2.5}$. This allowed the maximum ground level impacts, with respect to the relevant criteria, to be assessed. Actual plant emissions of PM are unlikely to only consist of only the smaller PM fractions and therefore this can be considered as a worst-case assumption.

3.2.4 Similarly, it was considered that the entire TOC emission consisted of only benzene. This allowed the maximum ground level impacts to be assessed with respect to the AQLV. Actual plant emissions of TOCs are unlikely to only consist of one species, resulting in a worst-case assessment.

3.2.5 Emissions have been based on the Emission Limit Values (ELVs) outlined within the draft EA document 'Environmental permitting technical guidance PG13/1(20)'. This ensures a robust approach has been considered.

3.3 Process Conditions

3.3.1 Process conditions for the emissions stack were provided through correspondence with V.C. Cooke Limited as shown in Appendix A. There is proposed to be one single stack for the facility. Table 7 shows the modelled process parameters.

Table 7 Model Input Process Conditions

Parameter	Unit	CHP Stack (Single)
Stack location	NGR	644129.1, 288386.5

Parameter	Unit	CHP Stack (Single)
Stack diameter	m	1.0
Stack height	m	36.0
Flue gas efflux velocity	m/s	10.12
Volumetric flow rate (Reference Conditions)	Nm^3/hr	14,859 (a)
Volumetric flow rate (actual)	m^3/s	7.95 (b)
Temperature	˚C	160

Notes:
(a) Reference conditions dry, standard pressure, 0^oC from manufacturer's data;
(b) Assumed actual conditions 5.5% O_2, moisture content 17.7%.

3.4 Emissions

3.4.1 The emission rates from the CHP were calculated based on maximum permitted emission concentrations given in the SWIP process guidance note PG13(20/1) for co-incineration plant. Two scenarios were considered where long and short term limit values apply:

- Long term (daily average) emission limit concentrations for comparison against long and short term EQSs; and
- Short term (half-hourly average) maximum concentrations for comparison against short term EQSs.

3.4.2 To ensure that permitted NOx emission limits are achieved a selective noncatalytic reduction (SNCR) system is proposed to be installed. This will provide abatement to NOx emissions within the flue gases and typically can achieve a 50% reduction.

3.4.3 The calculated mass emissions rates in grams per second are shown in Table 8. It is therefore considered that the maximum permissible emissions rates will be continuously emitted and that a worst-case assessment has been provided.

Table 8 Emission Rates

Pollutant	Daily Emission Limit (mg/Nm^3)[a]	Mass Emission Rate (g/s)	30 Minute Emission Limit (mg/Nm^3)	Mass Emission Rate (g/s)
NO_X	300	1.280	600	2.559
CO	75	0.320	150	0.640
PM	15	0.064	45	0.1924
TOC	15	0.064	30	0.1283
HCl	15	0.064	90	0.1283
HF	3	0.0128	6	0.02565
SO_2	75	0.320	300	1.2826
PCDD/Fs	0.0000001	0.00000000043	-	-
Group 1 Metals (b)	0.05	0.00021	-	-
Group 2 Metals (c)	0.05	0.00213	-	-
Group 3 Metals (d)	0.01	0.00021	-	-

Notes:
(a) Reference conditions 0^oC, dry, 6% oxygen, standard pressure. Actual conditions 5.5% O_2, moisture content 17.7%.
(b) For the purposes of this assessment: Cadmium;
(c) For the purposes of this assessment: Mercury;
(d) For the purposes of this assessment: Arsenic, Lead, Chromium, Copper, Nickel, Vanadium, Antimony.

3.5 Time Varied Emissions

3.5.1 Modelling has been undertaken assuming the plant is in operation 24 hours per day for 365 days per year. This again is considered as a worst case assessment as it does not account for operational downtime for repairs and cleaning. By modelling the emissions continuously each modelled year, this has ensured a worst-case assessment has been undertaken.

3.6 Assessment Extents

3.6.1 Ambient concentrations were predicted over the following area grid to allow pollutant contours where required:

- NGR: 643030, 287870 to 644890, 289390.

3.6.2 One Cartesian grid with a resolution of 10 m and a height of 1.5 m was included in the model. Results were subsequently used to produce contour plots within the Surfer software package where required.

3.7 Human Sensitive Receptors

3.7.1 A sensitive receptor is defined as any location which may be affected by changes in air quality. A desk-top study was undertaken to identify any sensitive human receptor locations in the vicinity of the site that required specific consideration during the assessment. Receptor locations (R6, R21 and R22) were included to represent worst-case locations on the Beccles and Worlingham Garden Neighbourhood allocation site (WLP3.1) to the north-west of the proposed development site.

3.7.2 Emissions were modelled at the receptors at the minimum height of relevant exposure and the maximum height with reference to the flue height. The modelled receptors are summarised in Table 9.

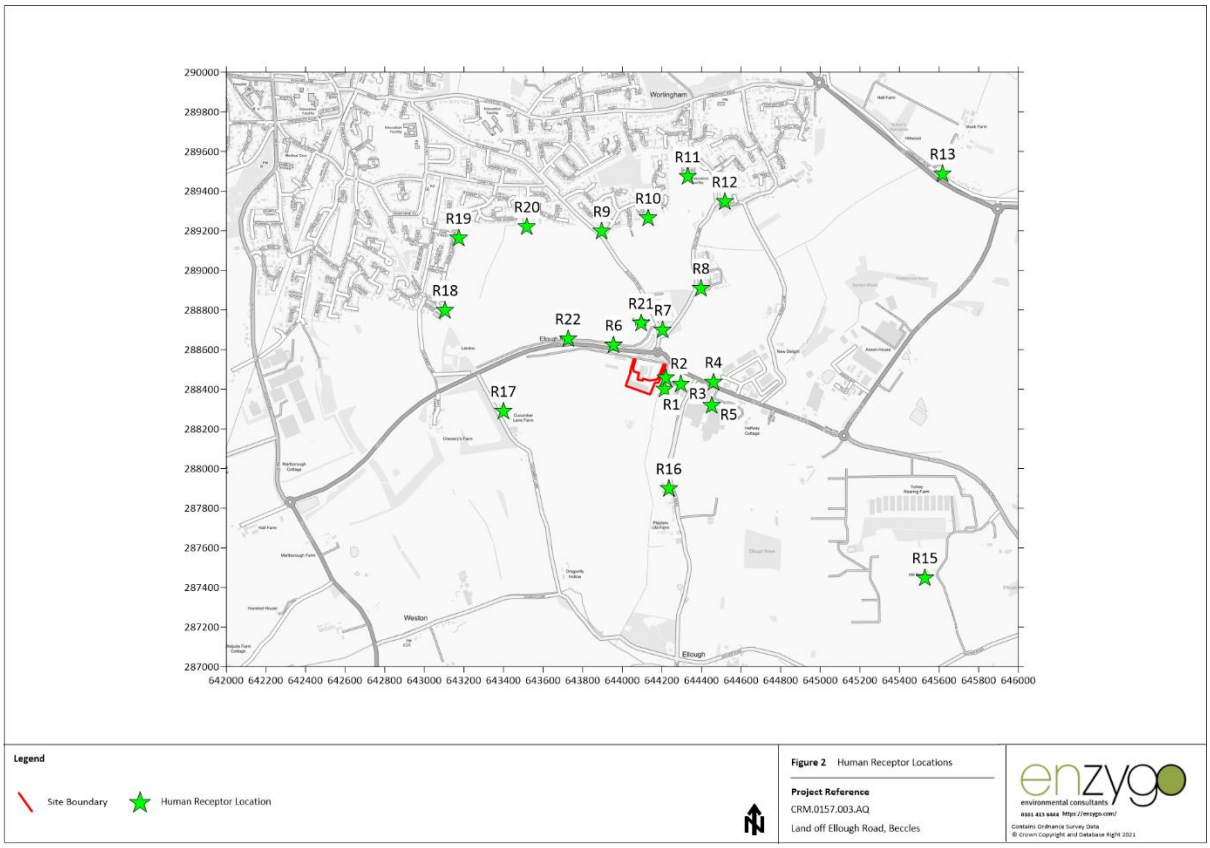
Table 9 Sensitive Human Receptors

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
R1	Wagg Motor Engineers	Industrial	644212.3	288398.3	84	1.5
R2	Truck and Plant Engineering	Industrial	644220.7	288456.4	115	1.5
R3	Denmans	Industrial	644295.4	288425.8	171	1.5
R4	MH Goals	Industrial	644460.0	288434.7	334	1.5
R5	M&H Plastics	Industrial	644452.1	288315.9	331	1.5
R6	WLP A	Residential	643956.7	288622.0	292	1.5
R7	Guardwell Coatings	Industrial	644204.8	288698.2	321	1.5
R8	SEA Scaffolding	Industrial	644397.6	288908.5	587	1.5
R9	1 Cedar Drive, Worlingham	Residential	643896.3	289196.4	843	1.5
R10	The Laurels, Worlingham	Residential	644129.8	289262.6	876	1.5
R11	Worlington CEVC Primary School	Residential	644329.8	289472.0	1,104	1.5
R12	Manor Close, Worlingham	Residential	644517.3	289345.8	1,035	1.5
R13	Lowestoft Road	Residential	645617.9	289486.4	1,851	1.5
R14	Gents Farm, Brock Road	Residential	646326.2	288834.0	2,242	1.5

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
R15	Hill Farm	Residential	645528.3	287447.5	1,685	1.5
R16	Church Road	Residential	644234.8	287897.8	500	1.5
R17	Cottage, Cucumber Lane	Residential	643399.1	288288.5	737	1.5
R18	21 Oak Lane, Worlingham	Residential	643105.4	288798.0	1,103	1.5
R19	95 Queen Elizabeth Drive, Worlingham	Residential	643173.2	289161.1	1,230	1.5
R20	2 Foxglove Close, Worlingham	Residential	643518.5	289219.1	1,032	1.5
R21	WLP B	Residential	644094.6	288732.0	347	1.5
R22	WLP C	Residential	643725.5	288653.7	484	1.5

3.7.3 The modelled human receptor locations are displayed in Figure 2.

Figure 2 – Modelled Human Receptor Locations



3.8 Ecological Sensitive Receptors

3.8.1 The EA guidance 'Air emissions risk assessment for your environmental permit' states:

"Note that conservation sites need only be considered where they fall within set distances of the activity:

- SPAs, SACs or Ramsar sites within 10km of the installation; and
- SSSIs, National Nature Reserves (NNRs), Local Nature Reserves (LNRs), County Wildlife Sites (CWS) and Ancient Woodland (AW) within 2 km of the location."

3.8.2 A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the distances stated above. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC) web-based interactive mapping service, which draws information on key environmental schemes and designations.

3.8.3 Some designations were included that are located further than the EA distance suggestions to ensure that all potentially sensitive areas were considered.

3.8.4 Additionally, to consider some non-statutory designations not included on the MAGIC such as CWS a search was commissioned with the Suffolk Biodiversity Data Centre. This identified 2 County Wildlife Sites (CWS) within 2 km of the proposed development site. An additional 2 CWS at slightly greater distances were also included in the assessment.

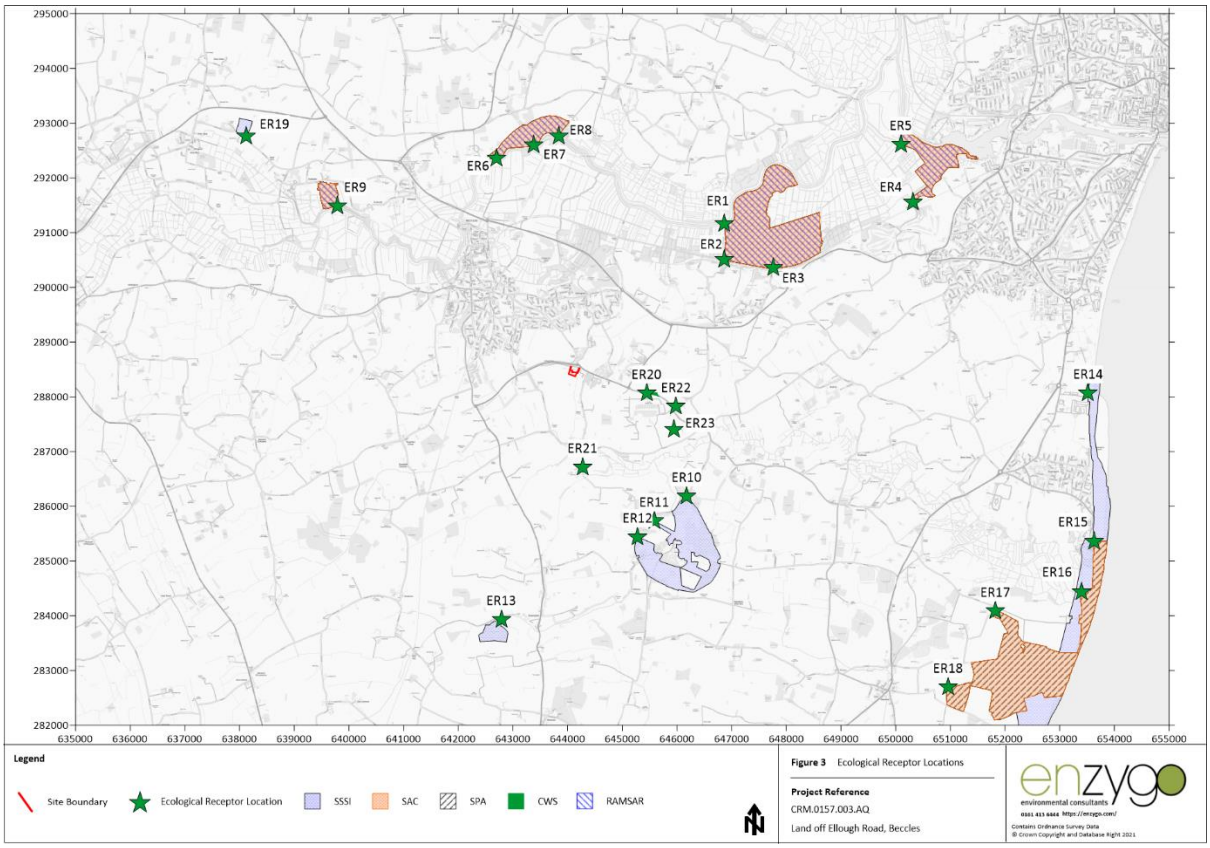
3.8.5 The receptor points are chosen to represent the closest points to the proposed site and are displayed in Table 10 and Figure 3.

Table 10 Ecological Sensitive Receptors

Ecological Receptor		NGR (m)		Distance from Centre of Site (m)
		X	Y	
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	646866.7	291156.3	3,894
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	646866.7	290505.0	3,462
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	647759.8	290353.7	4,129
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	650316.7	291552.8	6,951
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	650092.2	292613.4	7,309
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	642704.3	292362.6	4,224
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	643376.9	292593.5	4,274
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	643834.0	292755.5	4,379
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	639794.0	291486.6	5,330
ER10	Sotterley Park (SSSI)	646176.6	286184.3	3,007
ER11	Sotterley Park (SSSI)	645584.0	285728.9	3,030
ER12	Sotterley Park (SSSI)	645279.4	285438.6	3,164
ER13	Titsal Wood, Shadingfield (SSSI)	642787.9	283932.0	4,652
ER14	Pakefield to Easton Bavents SSSI	653516.4	288069.5	9,393
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	653628.7	285350.7	9,973
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	653396.6	284432.0	10,076
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	651820.3	284083.9	8,813
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	650955.7	282697.3	8,886
ER20	Ellough Airfield (CWS)	645444.1	288065.2	1,354
ER21	Ellough Churchyard	644273.0	286715.9	1,677

Ecological Receptor		NGR (m)		Distance from Centre of Site (m)
		X	Y	
ER22	Scarls Grove	645984.2	287823.1	1,939
ER23	Ellough Grove	645941.4	287398.8	2,064

Figure 3 – Modelled Ecological Receptor Locations



3.9 Baseline Conditions

3.9.1 A desktop study was undertaken to define the baseline air quality within the vicinity of the development. The baseline year will correspond with either the current year or the most recent year that monitoring data is available.

3.9.2 Pollutant background concentrations for the site, monitoring and human receptor locations have been sourced from the DEFRA background maps and national monitoring. Background concentrations and depositions for ecological receptors have been derived from the APIS website[6].

3.9.3 A roadside baseline NO_2 concentration was used for receptor locations close to major roads.

3.9.4 All Baseline information is detailed in Section 4.0.

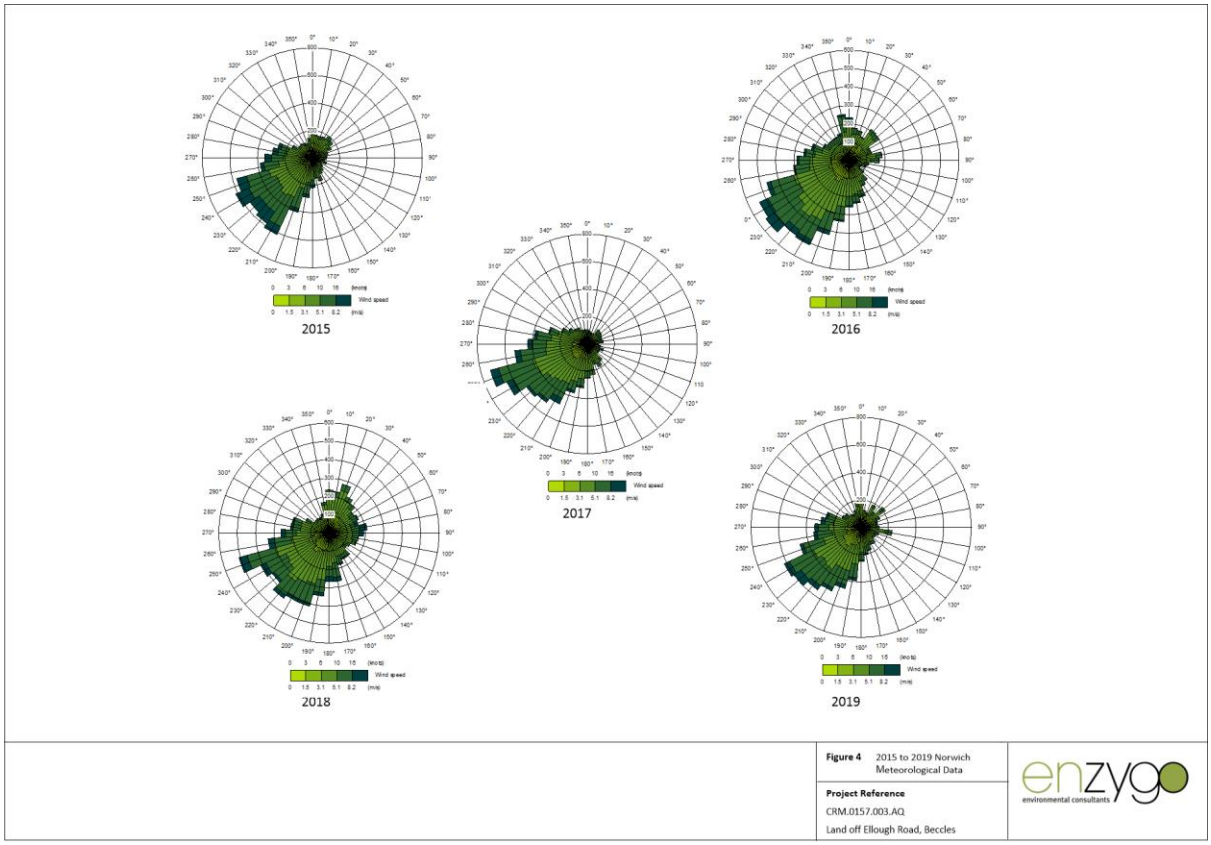
3.10 Meteorological Data

3.10.1 Five years of hourly sequential meteorological data used in this assessment was taken from Norwich meteorological station located approximately 29 km north west of the facility at the approximate NGR: 623260, 308350.

3.10.2 Reference should be made to Figure 4 for the 5-year wind rose dataset. All meteorological data used in the assessment was provided by ADM Ltd, which is an established distributor of

meteorological data within the UK. Maximum emissions across the five years (2015 - 2019) were used to ensure a worse case assessment.

Figure 4 – Meteorological Data Wind Roses



3.11 Roughness Length

3.11.1 The specific roughness length (z_0) values used to represent conditions in the vicinity of the application site, as well as conditions at the meteorological are summarised in Table 11.

Table 11 Utilised Roughness Length

Location	Roughness length (m)	ADMS Description
Application Site	0.3	Agricultural (max)
Meteorological Station	1	Cities, woodlands

3.11.2 Both values of z_0 are considered appropriate for the morphology of the assessment area.

3.12 Monin-Obukhov Length

3.12.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. The specific length values used to represent conditions in the vicinity of the application site, as well as conditions at the meteorological are summarised in Table 12.

Table 12 Utilised Monin-Obukhov Lengths

Location	Monin-Obukhov length (m)	ADMS Description
Application Site	10	Small Towns <50,000
Meteorological Station	30	Meteorological Station

3.12.2 Both Monin-Obukhov values are considered appropriate for the morphology of the assessment area.

3.13 Surface Albedo and Priestley-Taylor Parameter

3.13.1 The surface albedo and Priestley-Taylor parameters used in the assessment were the model default values of 0.23 and 1 respectively.

3.14 Terrain Data

3.14.1 Ordnance Survey Landform Panorama terrain data was included 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.

3.14.2 This was pre-processed using the dedicated function within ADMS 5 and covers a 11.5 km x 11.5 km area extending from the centre of the proposed site.

3.15 Building Effects

3.15.1 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 base of buildings than would arise in the absence of the buildings.

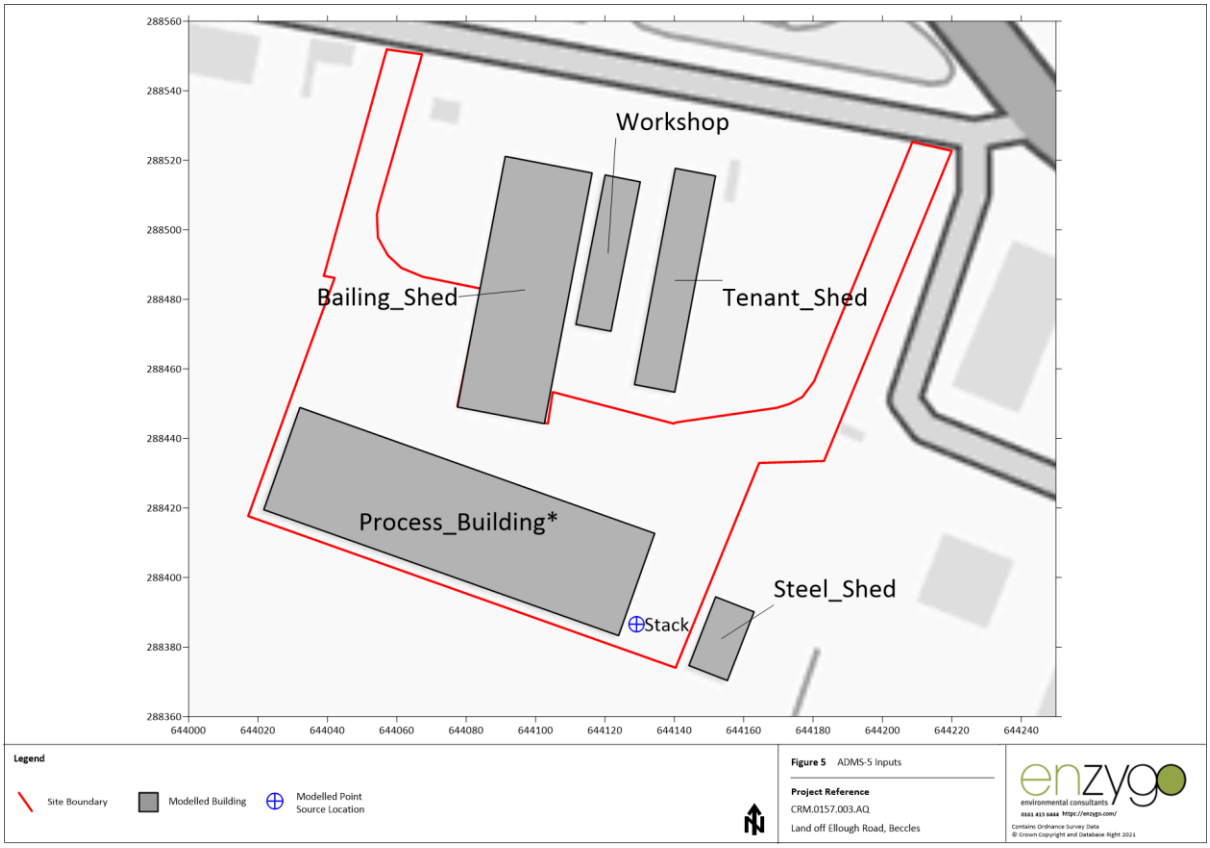
3.15.2 Building heights were approximated using the Google Earth Pro software which provides 3D visualisations of building structures. The buildings included within the model are summarised in Table 13.

Table 13 Building Geometries

Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Process Building	644078.0	288416.1	11.4	31.2	108.5	199.5
2	Bailing Shed	644096.9	288482.7	8.1	73.4	25.5	190.8
3	Workshop	644120.9	288493.3	5.5	43.8	10.3	191.1
4	Tenant Shed	644140.2	288485.5	5.5	63.3	11.8	190.7
5	Steel Shed	644153.6	288382.4	3.0	21.2	11.9	201.3

3.15.3 Reference should be made to Figure 5 for a graphical representation of the modelled building layout and the ADMS 5 model input.

Figure 5 - Model Input



3.16 NO_x to NO_2 Conversion

3.16.1 Emissions of NOx from combustion processes are predominantly in the form of NO. Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO_2.

3.16.2 Ground level NOx concentrations were predicted through dispersion modelling. NO_2 concentrations reported in the results section assume 70% conversion from NO_x to NO_2 for long term concentrations and 35% conversion for short-term concentrations, based upon EA guidance.

3.17 15-minute Sulphur Dioxide Concentration Predictions

3.17.1 Throughout the assessment, 15-minute mean SO_2 concentrations have been calculated using the following correction factor based upon empirical relationships with the 99.9th percentile of 1-hour means, as described in EA guidance :

99.9th percentile of 15-minute means = 1.34 x 99.9th percentile of 1-hour means

3.18 Deposition Rates

3.18.1 Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'[7]. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 14.

[7] AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

Table 14 Conversion Factors to Determine Dry Deposition Flux

Pollutant	Grassland Deposition Velocity (m/s)	Forest Deposition Velocity (m/s)	Conversion Factor (µg/m^2/s to kg/ha/yr of pollutant species)
NO_2	0.0015	0.003	95.9
SO_2	0.012	0.024	157.7
HCl	0.025	0.06	306.7

3.18.2 Acid deposition occurs from chemical reactions arising from emissions of NO_2, SO_2 and HCl. Predicted ground level pollutant concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors.

3.18.3 The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken by multiplying the dry deposition flux by the standard conversion factors shown in Table 15.

Table 15 Conversion Factors to Units of Equivalents

Species	Conversion Factor from kg/ha/yr to keq/ha/yr
N	Divide by 14
S	Divide by 16
H	Divide by 35.5

3.18.4 The total N proportion was calculated from NO_2 concentrations, whilst the HCl equivalent was added to the S proportion, in accordance with the methodology outlined in AQTAG 06[7]. The proportion of the Environmental Quality Standard (EQS) consisting of the process contribution (PC) and predicted environmental concentration (PEC) were then calculated using the tool available on the Air Pollution Information System (APIS) website.

3.19 Assessment Criteria

3.19.1 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant AQOs identified within Table 1 to Table 5

3.20 Significance of Impacts

EA Guidance Criteria

3.20.1 Guidance for assessing the significance of emissions impacts from point sources for permit applications are given in the EA's online guidance.

3.20.2 Predicted pollutant concentrations are summarised in the following formats:

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

First Screening Stage

3.20.3 The significance of predicted impact has been assessed in accordance with criteria in the EA guidance 'Air emissions risk assessment for your environmental permit' and through consideration of likely effects as a result of the proposals. The EA guidance states that process contributions can be considered insignificant if:

- 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.

3.20.4 If both criteria are met predicted impacts can be considered insignificant and no further analysis is required.

Second Screening Stage

3.20.5 If the above criteria are not met then a second stage of screening to determine the impact of the PEC is required:

- 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.

3.20.6 If both of these criteria are met during the second stage of screening then predicted impacts can be considered insignificant. Should these criteria be exceeded then the PEC should be checked against the EQS.

Group 3 Metals

3.20.7 The EA have issued a document 'Guidance on assessing group 3 metal stack emissions from incinerators'[8] for the modelling of group 3 metal (Sb, As, Pb, Cr, Ni and V) emissions from waste incinerators. This was reviewed for the purpose of the assessment with the methodology outlined below:

- Step 1 - Worst case screening: Make predictions assuming each metal is being emitted at 100% of the group ELV. Where the PC of any metal exceeds 1% of a long-term or 10% of a short-term Environmental Quality Standard (EQS) then the PEC is compared against the relevant EQS. If the PEC is greater than 100% of the EQS then proceed to Step 2;
- Step 2 - Case specific screening: Use the maximum emissions data listed within Appendix A of the EA guidance. Where the PC of any metal exceeds 1% of a long-term or 10% of a short-term EQS then the PEC is compared against the relevant EQS. This can be screened out where the PEC is less than 100% of the relevant EQS.

3.20.8 The EA guidance[8] provides measured emissions data obtained from 18 municipal waste incinerators and waste wood co-incinerators between 2007 and 2015. It should be noted that the measured data relates to facilities subject to Industrial Emission Directives and therefore provide capacities >50 MW. The proposed facility has a capacity of 5 MW and therefore emissions from the proposed facility are likely to be significantly lower than those used in the assessment.

Ecological Receptors – EA Guidance

3.20.9 If emissions that affect Special Protection Areas (SPAs), Special Areas of Conservation (SACs), RAMSAR sites or Site of Special Scientific Interest (SSSIs) meet both of the following criteria outlined within the EA guidance 'Air emissions risk assessment for your environmental permit', they can be considered insignificant:

[8] 'Guidance on assessing group 3 metal stack emissions from incinerators', Environment Agency, Undated.

- the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas; and
- the long-term PC is less than 1.0% of the long-term environmental standard for protected conservation areas.

3.20.10 If the predicted long-term PC is greater than 1.0% and the PEC is less than 70% of the long-term environmental standard, the emissions can be considered insignificant. Should the predicted PEC be greater than 70% of the long-term environmental standard, the PEC should be checked against the EQS for the ecological receptor.

3.20.11 When considering impacts at local nature sites and the emissions meet both of the following criteria, impacts can be considered insignificant if:

- The short-term PC is less than 100% of the short-term environmental standard; and
- The long-term PC is less than 100% of the long-term environmental standard.

3.20.12 In addition, the EA guidance also states that the APIS site relevant critical load tool should be used to determine whether there is an exceedance of deposition of nutrient nitrogen or acidity, as the standard of exceedance is site-specific.

3.21 In Combination Effects

3.21.1 In line with Natural England advice this report includes in-combination effects from any current or recently permitted developments which, when considered in combination with the impacts of this assessment, could cause significant impacts at ecological receptors.

3.21.2 Natural England stated in their response that should the in-combination effect "mean that the process contribution is above 1% of the critical level (4% for SSSIs), then further assessment will be required. This may be through an appropriate assessment for European Sites, or through a SSSI Impact Assessment for SSSIs."

3.21.3 This assessment has therefore considered in combination effects against these criteria. It also takes account of Natural England internal guidance which states:

> *"In general terms, it is important for a competent authority to remember that the subject plan or project remains the focus of any in-combination assessment. Therefore, it is Natural England's view that care should be taken to avoid unnecessarily combining the insignificant effects of the subject plan or project with the effects of other plans or projects which can be considered significant in their own right. The latter should always be dealt with by its own individual HRA alone. In other words, it is only the appreciable effects of those other plans and projects that are not themselves significant alone which are added into an incombination assessment with the subject proposal (i.e. 'don't combine individual biscuits (=insignificant) with full packs (=significant)')."*

3.21.4 The background concentrations and levels used in this assessment include emissions up to 2020 and therefore any new developments that caused additional ammonia emissions not accounted for in background levels were identified.

3.22 Modelling Uncertainties

3.22.1 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.

3.22.2 Potential uncertainties in 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 5.2.2.0 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 meteorological data sets between 2014 and 2019 from the most appropriate observation site to the development to take account of worst-case conditions;
- Plant operating conditions - Operational parameters were supplied by V.C. Cooke Limited. As such, these are considered to be representative of likely operating conditions;
- Emission rates – based on proposed SWIP permitting emission limits. As such, these are considered to be worst case emissions and actual emissions are likely to be considerably less than this. As an additional worst case consideration, the facility was modelled to be operational continuously;
- Background concentrations - Obtained from the DEFRA mapping study for human receptors and national monitoring networks. Although these may underestimate actual concentrations in the vicinity of pollutant sources, such as roads, they are considered suitable for an assessment of this nature;
- Receptor locations - A Cartesian Grid at a height of 1.5m, to replicate breathing height, was included in the model to predict concentrations throughout the assessment extents. Specified Receptor points were also included at sensitive locations to provide additional consideration of these areas; and
- Variability - All model inputs are as accurate as possible and worst-case conditions have been considered where necessary in order to ensure a robust assessment of potential pollutant concentrations.

3.22.3 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.

3.23 Odour

3.23.1 There is potential for odour impacts to sensitive locations within the vicinity of the site. Potential odour sources are from Refuse Derived Fuel (RDF) delivery vehicles and odours from the storage and processing of the RDF feedstock material.

3.23.2 It should be noted that control of odours will be detailed by the site's permit application and resulting operation conditions.

3.23.3 The RDF does not contain any food waste and is of a low odour potential. It should be noted that the current operations for a materials recovery facility are within the existing enclosed

building and it is understood that there is no history of odour complaints relating to the current operations.

3.23.4 The proposed operations are to provide an RDF waste incineration operation within the existing building.

3.23.5 The RDF will arrive on site via articulated lorry via the neighbouring permitted waste site and be deposited directly onto the walking floor located within the waste reception building. Therefore no waste will be stored on the site or accepted unless required for the energy recovery process. The building will be fitted with fast acting roller shutter doors and it is understood that a negative pressure will be provided by the combustion process.

3.23.6 The combustion process is a completely enclosed process and has no potential for significant odours, as odorous compounds are destroyed during treatment. The combustion unit is also located within the waste reception building.

3.23.7 The char which is produced as part of the combustion process is not considered to be inherently odorous. The char will be stored within two bulk char storage vessels and will be removed off site weekly.

3.23.8 As such, the proposals are not considered to generate any additional impacts or significant odour emissions.

4.0 Baseline Conditions

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

4.1 Local Air Quality Management

4.1.1 As required by the Environment Act (1995), ESC has undertaken Review and Assessment of air quality within their area of administration. This process concluded that annual mean concentrations of NO_2 are above the AQO within the district. As such, six Air Quality Management Areas (AQMAs) have been declared.

4.1.2 The proposed development is located greater than 25 km from the closest AQMA (Norwich City AQMA). As such, there is no potential for the development to cause adverse impacts to air quality within an AQMA.

4.1.3 ESC has concluded that concentrations of all other pollutants considered within the AQS are currently below the relevant AQOs and as such no further AQMAs have been designated.

4.2 Local Air Quality Monitoring

4.2.1 Monitoring of pollutant concentrations is undertaken by ESC throughout their area of administration using continuous and passive techniques. A review of ESC's most recent Air Quality Status Report[9] indicated that there are no automatic analysers currently operated by ESC in the vicinity of the site.

4.2.2 A review of ESC's most recent air quality monitoring data indicated five diffusion tubes located within 5 km of the application site, presented in Table 16. Whilst these locations are not considered close the development site or representative of conditions there, they do represent concentrations within the A7 AQMA.

Table 16 Diffusion Tube Monitoring Results

ID	Site Name	Type	NGR (m)		Dist' to Site (m)	Annual Mean Concentration (µg/m³)		
			X	Y		2018	2019	2020
BEC 1	10 Ingate	Roadside	642615	289909	2147	24.9	23.3	17.8
BEC 3	Fredricks Road	Roadside	642553	289922	2200	34.7	33.6	25.0
BEC 4	1 Ingate	Roadside	642564	289922	2193	24.2	20.8	16.7
BEC 5a,b,c	11 Ingate	Kerbside	642592	289916	2168	33.2	29.3	22.4
BEC 6	Old Market	Roadside	642158	290574	2945	25.7	26.1	20.9

4.2.3 As indicated in Table 16, the annual mean AQO for NO_2 was not exceeded at the roadside and kerbside monitoring locations in recent years. The monitored concentrations for 2020 and 2021 will be affected by COVID lockdown measures.

4.2.4 All monitors are located near roads in the centre of Beccles and concentrations at these locations are likely to be significantly greater than those near the development site where the surrounding environment is more open.

4.2.5 BEC 6 is located near a bus station and BEC 3 and BEC 4 are located at an urban road junction and therefore considered least representative of near site conditions . In the absence of a more representative roadside monitor, the maximum recently monitored concentration at BEC 1 and

[9] 2022 Air Quality Annual Status Report, East Suffolk Council, September 2022

BEC 5 of 33.2 µg/m³ was used as a worst-case background concentration at receptor locations near major roads considered within this assessment. This was applied to receptors R4, R6, R7, R9, R21 and R22. It should be noted that these receptors are not roadside locations by definition and baseline concentrations at these locations are likely to be notably lower than at locations within 2 m of the roadside in Beccles.

4.3 Dioxide and Furans Monitoring

4.3.1 Monitoring of dioxins and furans is undertaken throughout the UK through the TOMPs network. Throughout this report, the term 'dioxins' is taken to mean the family of 210 compounds or congeners comprising polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs). If both PCDDs and PCDFs are present, these have been referred to as PCDD/Fs. The summation of the concentrations of 17 toxic PCDD and PCDF congeners, weighted relative to the toxicity of 2,3,7,8-TCDD, is given in the form of Toxic Equivalents (TEQ).

4.3.2 The closest TOMPs monitoring site is Weybourne at NGR: 609834, 343796. The most recent data available from this site is from 2020 and is summarised in Table 17.

Table 17 Dioxins and Furans Monitoring Results

Species	Unit	2020 Annual Mean Concentration
PCDD/Fs	TEQ fg/m³	17.775

4.3.3 The rural background location of the monitoring site is considered similar that of the development site.

4.4 Acid Gas Monitoring

4.4.1 Concentrations of HCl and SO_2 are monitored in the UK through the UK Eutrophying and Acidifying Pollutants (UKEAP): acid gas and aerosol network. The closest site is the rural background location at Stoke Ferry at NGR: 569982, 298730. The most recent data available from this site is from 2019 for HCl and SO_2, as summarised in Table 18.

Table 18 Acid Gas Monitoring Results

Species	Annual Mean Concentration (µg/m³)
HCl	0.22
SO_2	0.47

4.4.2 Baseline concentrations of HF are not measured locally or nationally since these are not generally of concern in terms of local air quality. However, the Expert Panel on Air Quality Standards (EPAQS) report "Guidelines for halogens and hydrogen halides in ambient air for protecting human health against acute irritancy effects" contains some estimates of baseline levels. This indicates that typical exposure concentrations in heavily polluted areas have been in the range of 0.5 µg/m³ to 2 µg/m³.

4.4.3 In the absence of local monitoring data, the maximum typical baseline HF concentration has been used for the purpose of this assessment.

4.5 Heavy Metals Monitoring

4.5.1 Monitoring of heavy metals is carried out by DEFRA at 24 industrial sites and 10 rural sites throughout the UK. The closest monitoring locations to the site is Heigham Holmes (NGR: 644179, 320519). The most recent data available from the site is from 2021 and is summarised in Table 19. Heigham Holmes does not monitor Hg and Sb concentrations and as such, background concentrations for these pollutants were taken from the Detling (NGR: 580110,

159703) monitoring location. The most recent monitoring data available from these locations is from 2013.

Table 19 Metals Monitoring Results

Species	Annual Mean Concentration (ng/m^3)
As	0.55
Cd	0.09
Cr (total)	0.39
Cr (VI)	0.08
Cu	1.49
Ni	0.54
Pb	2.93
V	1.13
Hg	0.68
Sb	1.33

4.5.2 In line with the EA document 'Guidance on assessing group 3 metal stack emissions from incinerators'[8], the Cr (VI) background concentrations comprises 20% of the total background Cr concentration.

4.6 Background Pollutant Concentrations

4.6.1 Pollutant background concentrations for the site, monitoring and receptor locations have been obtained from various sources including DEFRA background maps, national monitoring networks and the Air Pollution Information System (APIS) website.

DEFRA Background Concentrations

4.6.2 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 LAs in their Review and Assessment of air quality. The assessment extents are located in the following grid squares NGR:

- 644500, 288500
- 643500, 289500
- 644500, 289500
- 645500, 288500
- 645500, 287500
- 644500, 287500
- 643500, 288500
- 643500, 289500
- 645500, 289500

4.6.3 Data for these locations was downloaded from the DEFRA website for NOx, NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for the purpose of this assessment. Since the receptor locations used in the operational phase assessment were located in several grid squares, predicted concentrations from their

respective grid squares were used to represent their respective background concentrations for the modelling process. These are summarised in Table 20.

Table 20 Predicted DEFRA Background Pollutant Concentrations

DEFRA Grid Square	2022 Predicted Background Concentration (µg/m³)						
	NO_2	NO_x	PM_{10}	$PM_{2.5}$	CO	TOC	SO_2
644500, 288500	9.53	12.56	17.53	11.14	235	0.184	2.22
643500, 289500	9.05	11.83	15.01	9.89	237	0.189	2.60
644500, 289500	8.60	11.20	15.26	9.52	237	0.190	2.20
645500, 289500	8.56	11.13	15.62	9.34	230	0.172	2.04
645500, 288500	7.33	9.44	15.30	8.88	227	0.161	1.94
645500, 287500	7.04	9.03	15.20	8.76	225	0.162	1.92
644500, 287500	7.16	9.20	15.11	8.79	227	0.169	1.92
643500, 288500	8.04	10.42	15.60	9.51	234	0.182	2.34
643500, 289500	9.05	11.83	15.01	9.89	237	0.189	2.60

4.6.4 Background concentrations for NO_X, NO_2, PM_{10} and $PM_{2.5}$ were predicted for 2022, whilst benzene was predicted for 2010 and CO and SO_2 were predicted for 2001. These are the most recent predictions available from DEFRA.

4.6.5 Contour plots for pollutants used the maximum background concentrations of those given in this report. This may lead to some discrepancies between tabled PEC concentrations and those plotted in the contour figures. This is particularly noticeable for NO_2 contour plots where a monitored roadside background concentration was assumed over the entire modelled extents and therefore most locations represented in Figure 6 can be considered to show a large overestimate of actual concentrations.

Short term Background Concentrations

4.6.6 With relation to short-term background concentrations, it was assumed that the short-term concentration of a substance is twice its long-term concentration as suggested within EA risk assessment for your environmental permit guidance.

4.7 Ecological Impacts Baselines

4.7.1 Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website was undertaken in order to identify the most suitable habitat description and associated critical load for the designations considered within the model. It should be noted that for the SSSI receptors with multiple habitats, the most sensitive habitat has been taken for both nitrogen and acid deposition have been utilised for the purpose of this assessment. The critical loads for nitrogen deposition are presented in Table 21.

4.7.2 For local designations (CWS), critical loads and levels were defined using the APIS 'search by location' feature and selecting a representative sensitive habitat based on MAGIC map information and that provided by Suffolk Biodiversity Information Service.

Table 21 Nitrogen Critical Load

Ecological Designation	Sensitivity Class	Nitrogen Critical Load (kgN/ha/yr)	
		Min	Max
River Eden and Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)Tributaries (SAC/SSSI)	Transition mires and quaking bogs	5	15
River Eden (SAC) Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	Transition mires and quaking bogs	5	15
Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	Transition mires and quaking bogs	5	15
Sotterley Park (SSSI)	Broadleaved, Mixed and Yew Woodland - Lichens/Bogs	5	15
Titsal Wood, Shadingfield (SSSI)	Meso- and eutrophic Quercus woodland	15	20
Pakefield to Easton Bavents (SSSI)	Coastal stable dune grasslands - acid type	5	10
Benacre to Easton Bavents (SPA, SAC, SSSI)	Coastal stable dune grasslands - acid type	5	10
Ellough Airfield (CWS)	Dwarf Shrub Heath	5	15
Ellough Churchyard (CWS)	Non-mediterranean dry acid and neutral closed grassland	6	10
Scarls Grove	Dwarf Shrub Heath	5	15
Ellough Grove (CWS)	Broadleaved, Mixed and Yew Woodland	10	15

4.7.3 Table 22 shows the relevant critical loads for acid deposition.

Table 22 Acid Critical Load

Ecological Receptor		APIS Feature	Critical Load (ke/ha/yr)		
			CLmaxS	CLminN	CLmaxN
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.14	0.50
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-	0.18	0.32	0.50

Ecological Receptor		APIS Feature	Critical Load (ke/ha/yr)		
			CLmaxS	CLminN	CLmaxN
		silt-laden soils (Molinion caeruleae)			
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0.18	0.32	0.50
ER10-E12	Sotterley Park (SSSI) [a]	Unmanaged Broadleafed/Coniferous Woodland	0.19	0.32	0.52
ER13	Titsal Wood, Shadingfield (SSSI)	Unmanaged Broadleafed/Coniferous Woodland	2.38	0.36	2.74
ER14	Pakefield to Easton Bavents SSSI	Acid grassland	4.00	0.86	4.86
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	Acid grassland	4.00	0.86	4.86
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	Acid grassland	4.00	0.86	4.86
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	Acid grassland	4.00	0.86	4.86
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	Acid grassland	4.00	0.86	4.86
ER20	Ellough Airfield (CWS)	Dwarf Shrub Heath	1.63	0.71	2.34
ER21	Ellough Churchyard	Acid Grassland	0.48	0.22	0.70
ER22	Ellough Airfield (CWS)	Dwarf Shrub Heath	1.63	0.71	2.34
ER23	Ellough Grove	Broadleafed/Coniferous unmanaged woodland	2.38	0.36	2.74

Note: (a) No acid critical loads are given in APIS for Sotterley Park (SSSI) and therefore the baseline levels were used.

4.7.4 Background deposition rates at the ecological receptor location were downloaded from the APIS website and are summarised in Table 23.

Table 23 Background Deposition Rates

Ecological Receptor		Background Deposition Rate		
		Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)	
			N	S
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	15.30	0.62	0.13
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	15.30	0.62	0.13
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	15.30	0.62	0.13
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	13.90	0.62	0.13
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	13.90	0.62	0.13
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	16.70	0.73	0.19
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	16.70	0.73	0.19
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	16.70	0.73	0.19
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	17.00	0.68	0.14
ER10	Sotterley Park (SSSI)	27.40	0.70	0.10
ER11	Sotterley Park (SSSI)	27.40	0.70	0.10
ER12	Sotterley Park (SSSI)	27.40	0.70	0.10
ER13	Titsal Wood, Shadingfield (SSSI)	28.70	2.05	0.14
ER14	Pakefield to Easton Bavents SSSI	12.80	0.91	0.11
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	12.60	0.90	0.09
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	12.60	0.89	0.09
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	12.90	0.92	0.09
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	13.10	0.90	0.09
ER20	Ellough Airfield (CWS)	15.79	1.13	0.20
ER21	Ellough Churchyard	16.09	1.15	0.12
ER22	Ellough Airfield (CWS)	15.83	1.13	0.20
ER23	Ellough Grove	28.02	2.00	0.15

4.7.5 Background pollutant concentrations at the ecological receptor locations were downloaded from the APIS website and are summarised in Table 24.

Table 24 Background Concentrations

Ecological Receptor		Background Concentration ($\mu g/m^3$)	
		NO_X	SO_2
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	11.22	1.46
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	11.22	1.46
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	11.22	1.46

Ecological Receptor		Background Concentration (µg/m³)	
		NO_X	SO_2
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	11.6	1
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	11.6	1
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	11.9	1.3
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	11.9	1.3
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	11.9	1.3
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	10.7	1
ER10	Sotterley Park (SSSI)	9.6	1
ER11	Sotterley Park (SSSI)	9.6	1
ER12	Sotterley Park (SSSI)	9.6	1
ER13	Titsal Wood, Shadingfield (SSSI)	9.2	0.9
ER14	Pakefield to Easton Bavents SSSI	10.4	0.9
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	9.2	0.6
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	9.2	0.6
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	9.2	0.6
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	9.2	0.6
ER20	Ellough Airfield (CWS)	12.1	2.46
ER21	Ellough Churchyard	9.6	1.29
ER22	Ellough Airfield (CWS)	9.95	1.52
ER23	Ellough Grove	9.95	1.52

4.7.6 Results of the dispersion modelling exercise are detailed in Section 5.0.

5.0 Results

5.1 Introduction

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 3. Contour plots have only been provided for pollutant species where impact significance has determined using the secondary stage of the EA's screening criteria.

5.1.2 Predicted pollutant concentrations were predicted separately for 5 assessment years and the maximum concentration reported in the following sections for each relevant substance and metric. Concentrations were assessed in the following sections against EA guidance criteria[3].

5.1.3 For annual averaging periods only receptors defined in Table 4 for where the annual mean objectives apply have been included such as residential receptors. There is no relevant annual mean exposure to pollutants at industrial and commercial use locations.

5.2 Human Receptors

Nitrogen Dioxide

5.2.1 Predicted annual mean NO_2 process concentrations at sensitive receptors are summarised in Table 25.

Table 25 Predicted Annual Mean NO_2 Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.15	33.4	0.4	83
R9	1 Cedar Drive, Worlingham	0.13	33.3	0.3	83
R10	The Laurels, Worlingham	0.17	8.8	0.4	22
R11	Worlington CEVC Primary School	0.15	8.8	0.4	22
R12	Manor Close, Worlingham	0.21	8.8	0.5	22
R13	Lowestoft Road	0.12	8.7	0.3	22
R14	Gents Farm, Brock Road	0.09	7.4	0.2	19
R15	Hill Farm	0.05	7.1	0.1	18
R16	Church Road	0.20	7.4	0.5	18
R17	Cottage, Cucumber Lane	0.14	8.2	0.3	20
R18	21 Oak Lane, Worlingham	0.07	8.1	0.2	20
R19	95 Queen Elizabeth Drive, Worlingham	0.05	9.1	0.1	23
R20	2 Foxglove Close, Worlingham	0.08	9.1	0.2	23
R21	WLP B	0.27	33.5	0.7	84
R22	WLP C	0.15	33.3	0.4	83

Table Notes:
Predicted concentrations were assessed against the relevant EQSs 40 µg/m³.

5.2.2 Predicted 1-hour mean NO_2 process concentrations at sensitive receptors are summarised in Table 26.

Table 26 Predicted 99.79%ile 1-Hour Mean NO_2 Concentrations

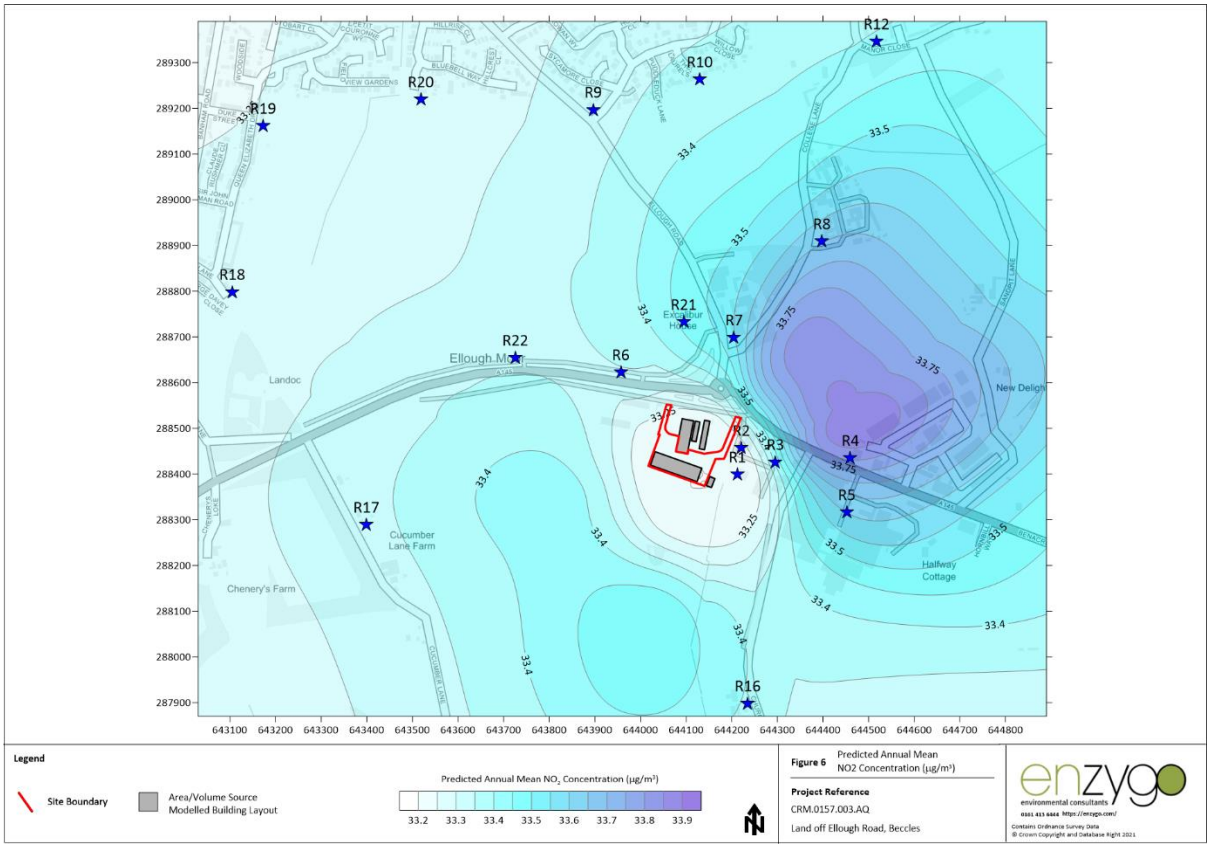
Receptor		Predicted 99.79%ile 1-Hour Mean NO_2 Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.12	19.19	0.1	11
R2	Truck and Plant Engineering	0.63	19.70	0.3	11
R3	Denmans	2.95	22.01	1.5	12
R4	MH Goals	3.81	70.21	1.9	53
R5	M&H Plastics	3.77	22.84	1.9	13
R6	WLP A	3.51	69.91	1.8	52
R7	Guardwell Coatings	3.49	69.89	1.7	52
R8	SEA Scaffolding	2.41	21.48	1.2	12
R9	1 Cedar Drive, Worlingham	1.72	68.12	0.9	51
R10	The Laurels, Worlingham	1.70	18.90	0.8	10
R11	Worlington CEVC Primary School	1.37	18.58	0.7	10
R12	Manor Close, Worlingham	1.48	18.68	0.7	10
R13	Lowestoft Road	0.94	18.06	0.5	10
R14	Gents Farm, Brock Road	0.74	15.41	0.4	8
R15	Hill Farm	0.93	15.02	0.5	8
R16	Church Road	2.73	17.05	1.4	9
R17	Cottage, Cucumber Lane	1.97	18.05	1.0	10
R18	21 Oak Lane, Worlingham	1.34	17.42	0.7	9
R19	95 Queen Elizabeth Drive, Worlingham	1.18	19.28	0.6	11
R20	2 Foxglove Close, Worlingham	1.40	19.50	0.7	11
R21	WLP B	3.67	70.07	1.8	52
R22	WLP C	2.72	69.12	1.4	52

Table Notes:
Predicted concentrations were assessed against the relevant EQSs:
99.79%ile 1-hour mean EQS of 200 µg/m³.

5.2.3 As indicated in Table 25 and Table 26, predicted annual mean NO_2 concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.4 As indicated in Figure 6 using a maximum (roadside) background concentration, the maximum 5-year PEC concentrations are below the EQS across the assessment extents.

Figure 6 Modelled Annual Mean NO_2 Contours



5.2.5 The PC proportion of the EQS does not exceed 1% at all relevant receptor locations and can be considered negligible and screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.6 As indicated in Table 25, predicted 99.79%ile 1-hour mean NO_2 concentrations were also below the relevant EQS at all sensitive receptor locations.

5.2.7 The NO_2 PC proportion of the EQS is less than 10% at all sensitive receptor locations and as such, impacts from 1-hour mean NO_2 concentrations can also be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.8 As such all NO_2 impacts can be considered as not significant.

Particulate Matter PM_{10}

5.2.9 Predicted annual mean PM_{10} process concentrations are summarised in Table 27.

Table 27 Predicted Annual Mean PM_{10} Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.01	15.6	0.0	39.0
R9	1 Cedar Drive, Worlingham	0.01	15.0	0.0	37.5
R10	The Laurels, Worlingham	0.01	15.3	0.0	38.2
R11	Worlington CEVC Primary School	0.01	15.3	0.0	38.2
R12	Manor Close, Worlingham	0.01	15.3	0.0	38.2
R13	Lowestoft Road	0.01	15.6	0.0	39.1

R14	Gents Farm, Brock Road	0.01	15.3	0.0	38.3
R15	Hill Farm	0.00	15.2	0.0	38.0
R16	Church Road	0.01	15.1	0.0	37.8
R17	Cottage, Cucumber Lane	0.01	15.6	0.0	39.0
R18	21 Oak Lane, Worlingham	0.01	15.6	0.0	39.0
R19	95 Queen Elizabeth Drive, Worlingham	0.00	15.0	0.0	37.5
R20	2 Foxglove Close, Worlingham	0.01	15.0	0.0	37.5
R21	WLP B	0.02	17.6	0.0	43.9
R22	WLP C	0.01	15.6	0.0	39.0

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 40 µg/m³.

5.2.10 Predicted 90.41%ile 24-hour mean PM_{10} concentrations are summarised in Table 28.

Table 28 Predicted 90.41%ile 24-Hour Mean PM_{10} Concentrations

Receptor		24-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.00	35.07	0.0	0.0
R2	Truck and Plant Engineering	0.01	35.07	0.0	0.0
R3	Denmans	0.05	35.11	0.1	0.3
R4	MH Goals	0.13	35.19	0.3	0.9
R5	M&H Plastics	0.10	35.17	0.2	0.7
R6	WLP A	0.05	31.24	0.1	0.2
R7	Guardwell Coatings	0.10	35.16	0.2	0.6
R8	SEA Scaffolding	0.10	35.16	0.2	0.7
R9	1 Cedar Drive, Worlingham	0.04	30.05	0.1	0.2
R10	The Laurels, Worlingham	0.05	30.56	0.1	0.3
R11	Worlington CEVC Primary School	0.04	30.55	0.1	0.2
R12	Manor Close, Worlingham	0.05	30.56	0.1	0.3
R13	Lowestoft Road	0.02	31.27	0.0	0.1
R14	Gents Farm, Brock Road	0.02	30.62	0.0	0.1
R15	Hill Farm	0.01	30.42	0.0	0.1
R16	Church Road	0.06	30.27	0.1	0.3
R17	Cottage, Cucumber Lane	0.04	31.23	0.1	0.2
R18	21 Oak Lane, Worlingham	0.02	31.22	0.0	0.1
R19	95 Queen Elizabeth Drive, Worlingham	0.02	30.03	0.0	0.1
R20	2 Foxglove Close, Worlingham	0.02	30.03	0.0	0.1
R21	WLP B	0.08	35.15	0.2	0.5
R22	WLP C	0.04	31.23	0.1	0.2

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 50 µg/m³.

5.2.11 As indicated in Table 27, predicted annual mean PM_{10} concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.12 The PC proportion of the EQS does not exceed 1% at all receptor locations and can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.13 As indicated in Table 28, predicted 90.41%ile 24-Hour Mean PM_{10} concentrations were also well below the relevant EQS at all sensitive receptor locations.

5.2.14 The PC proportion of the EQS is less than 10% at all sensitive receptor locations. As such, impacts on 24-hour mean TOC concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.15 As such all PM_{10} impacts are considered as not significant.

Particulate Matter ($PM_{2.5}$)

5.2.16 Predicted annual mean $PM_{2.5}$ concentrations are summarised in Table 29.

Table 29 Predicted Annual Mean $PM_{2.5}$ Concentrations.

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.05	31.24	0.1	0.2
R9	1 Cedar Drive, Worlingham	0.04	30.05	0.1	0.2
R10	The Laurels, Worlingham	0.05	30.56	0.1	0.3
R11	Worlington CEVC Primary School	0.04	30.55	0.1	0.2
R12	Manor Close, Worlingham	0.05	30.56	0.1	0.3
R13	Lowestoft Road	0.02	31.27	0.0	0.1
R14	Gents Farm, Brock Road	0.02	30.62	0.0	0.1
R15	Hill Farm	0.01	30.42	0.0	0.1
R16	Church Road	0.06	30.27	0.1	0.3
R17	Cottage, Cucumber Lane	0.04	31.23	0.1	0.2
R18	21 Oak Lane, Worlingham	0.02	31.22	0.0	0.1
R19	95 Queen Elizabeth Drive, Worlingham	0.02	30.03	0.0	0.1
R20	2 Foxglove Close, Worlingham	0.02	30.03	0.0	0.1
R21	WLP B	0.08	35.15	0.2	0.5
R22	WLP C	0.04	31.23	0.1	0.2

Table Notes:
Predicted concentrations were assessed against the relevant EQSs: Annual mean EQS of 25 µg/m³.

5.2.17 As indicated in Table 29, predicted annual mean $PM_{2.5}$ concentrations were well below the relevant EQS at all sensitive receptor locations.

5.2.18 The PC proportion of the EQS does not exceed 1% at all receptor locations and can be screened out as insignificant according to the criteria detailed in Section 3.20**.**

5.2.19 It should also be considered that the assessment assumes that all particulate matter is emitted as $PM_{2.5}$. The actual emission proportion is likely to be much less than this.

5.2.20 As such all $PM_{2.5}$ impacts are considered as not significant.

Carbon Monoxide

5.2.21 Predicted 8-hour rolling mean CO concentrations are summarised in Table 30.

Table 30 Predicted 8-Hour Rolling Mean CO Concentrations

Receptor		8-Hour Rolling Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.55	470.6	0.0	0.0
R2	Truck and Plant Engineering	0.79	470.8	0.0	0.0
R3	Denmans	1.88	471.9	0.0	0.0
R4	MH Goals	2.52	472.5	0.0	0.0
R5	M&H Plastics	2.06	472.1	0.0	0.0
R6	WLP A	1.80	469.8	0.0	0.0
R7	Guardwell Coatings	2.08	472.1	0.0	0.0
R8	SEA Scaffolding	1.41	471.4	0.0	0.0
R9	1 Cedar Drive, Worlingham	1.14	475.1	0.0	0.0
R10	The Laurels, Worlingham	1.06	475.1	0.0	0.0
R11	Worlington CEVC Primary School	0.81	474.8	0.0	0.0
R12	Manor Close, Worlingham	0.90	474.9	0.0	0.0
R13	Lowestoft Road	0.46	460.5	0.0	0.0
R14	Gents Farm, Brock Road	0.34	454.3	0.0	0.0
R15	Hill Farm	0.43	450.4	0.0	0.0
R16	Church Road	1.54	455.5	0.0	0.0
R17	Cottage, Cucumber Lane	1.22	469.2	0.0	0.0
R18	21 Oak Lane, Worlingham	0.78	468.8	0.0	0.0
R19	95 Queen Elizabeth Drive, Worlingham	0.66	474.7	0.0	0.0
R20	2 Foxglove Close, Worlingham	0.82	474.8	0.0	0.0
R21	WLP B	2.12	472.1	0.0	0.0
R22	WLP C	1.62	469.6	0.0	0.0

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 10,000 µg/m³.

5.2.22 As indicated in Table 30, predicted 8-hour rolling mean CO concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.23 In addition, the PC proportion of the EQS is less than 10% at all receptor locations. As such, impacts on 8-hour rolling mean CO concentrations are screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.24 As such all CO impacts are considered as not significant.

Total Organic Carbon

5.2.25 Predicted annual mean TOC concentrations (as benzene) are summarised in Table 31.

Table 31 Predicted Annual Mean TOC (as Benzene) Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.01	0.19	0.2	3.9
R9	1 Cedar Drive, Worlingham	0.01	0.20	0.2	4.0

R10	The Laurels, Worlingham	0.01	0.20	0.2	4.0
R11	Worlington CEVC Primary School	0.01	0.20	0.2	4.0
R12	Manor Close, Worlingham	0.01	0.20	0.3	4.1
R13	Lowestoft Road	0.01	0.18	0.2	3.6
R14	Gents Farm, Brock Road	0.01	0.17	0.1	3.4
R15	Hill Farm	0.00	0.17	0.1	3.3
R16	Church Road	0.01	0.18	0.3	3.7
R17	Cottage, Cucumber Lane	0.01	0.19	0.2	3.8
R18	21 Oak Lane, Worlingham	0.01	0.19	0.1	3.7
R19	95 Queen Elizabeth Drive, Worlingham	0.00	0.19	0.1	3.9
R20	2 Foxglove Close, Worlingham	0.01	0.19	0.1	3.9
R21	WLP B	0.02	0.20	0.4	4.1
R22	WLP C	0.01	0.19	0.2	3.9

Table Notes:

Predicted concentrations were assessed against the relevant EQSs: 5 µg/m^3

5.2.26 Predicted 24-hour mean TOC (as benzene) concentrations are summarised in Table 32.

Table 32 Predicted 24-Hour Mean TOC (as Benzene) Concentrations

Receptor		24-Hour Mean Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.63	1.00	2.1	3.3
R2	Truck and Plant Engineering	1.24	1.60	4.1	5.3
R3	Denmans	1.19	1.56	4.0	5.2
R4	MH Goals	0.67	1.04	2.2	3.5
R5	M&H Plastics	0.72	1.09	2.4	3.6
R6	WLP A	0.81	1.17	2.7	3.9
R7	Guardwell Coatings	0.73	1.10	2.4	3.7
R8	SEA Scaffolding	0.43	0.80	1.4	2.7
R9	1 Cedar Drive, Worlingham	0.31	0.68	1.0	2.3
R10	The Laurels, Worlingham	0.28	0.66	0.9	2.2
R11	Worlington CEVC Primary School	0.30	0.68	1.0	2.3
R12	Manor Close, Worlingham	0.28	0.66	0.9	2.2
R13	Lowestoft Road	0.29	0.63	1.0	2.1
R14	Gents Farm, Brock Road	0.24	0.56	0.8	1.9
R15	Hill Farm	0.28	0.60	0.9	2.0
R16	Church Road	0.48	0.81	1.6	2.7
R17	Cottage, Cucumber Lane	0.35	0.72	1.2	2.4
R18	21 Oak Lane, Worlingham	0.37	0.73	1.2	2.4
R19	95 Queen Elizabeth Drive, Worlingham	0.20	0.58	0.7	1.9
R20	2 Foxglove Close, Worlingham	0.25	0.62	0.8	2.1
R21	WLP B	0.66	1.03	2.2	3.4
R22	WLP C	0.48	0.85	1.6	2.8

Table Notes:

Predicted concentrations were assessed against the relevant EQSs: 24-hour mean EQS of 30 µg/m^3.

5.2.27 As indicated in Table 31, predicted annual mean TOC (as Benzene) concentrations were well below the relevant EQS at all sensitive receptor locations.

5.2.28 The PC proportion of the EQS does not exceed 1% at all sensitive receptor locations and annual mean impacts and screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.29 As indicated in Table 32, predicted 24-hour mean TOC (as Benzene) concentrations were also well below the relevant EQS at all sensitive receptor locations.

5.2.30 The PC proportion of the EQS is less than 10% at all sensitive receptor locations. As such, impacts on 24-hour mean TOC concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.31 The assessment assumes that all TOC is emitted as benzene. The actual emission proportion is likely to be much less than this.

5.2.32 As such all TOC (as benzene) impacts are considered as not significant.

Sulphur Dioxide

5.2.33 Predicted 99.18%ile 24-hour mean SO_2 concentrations are summarised in Table 33.

Table 33 Predicted 99.18%ile 24-Hour Mean SO_2 Concentrations

Receptor		24-Hour Mean Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.09	4.53	0.1	0.1
R2	Truck and Plant Engineering	0.15	4.59	0.1	0.1
R3	Denmans	0.53	4.97	0.4	0.4
R4	MH Goals	1.05	5.49	0.8	0.9
R5	M&H Plastics	0.92	5.36	0.7	0.8
R6	WLP A	0.77	5.45	0.6	0.6
R7	Guardwell Coatings	0.99	5.43	0.8	0.8
R8	SEA Scaffolding	0.96	5.40	0.8	0.8
R9	1 Cedar Drive, Worlingham	0.52	5.72	0.4	0.4
R10	The Laurels, Worlingham	0.54	4.94	0.4	0.4
R11	Worlington CEVC Primary School	0.40	4.80	0.3	0.3
R12	Manor Close, Worlingham	0.50	4.90	0.4	0.4
R13	Lowestoft Road	0.23	4.31	0.2	0.2
R14	Gents Farm, Brock Road	0.16	4.04	0.1	0.1
R15	Hill Farm	0.17	4.01	0.1	0.1
R16	Church Road	1.01	4.85	0.8	0.8
R17	Cottage, Cucumber Lane	0.69	5.37	0.6	0.6
R18	21 Oak Lane, Worlingham	0.32	5.00	0.3	0.3
R19	95 Queen Elizabeth Drive, Worlingham	0.25	5.45	0.2	0.2
R20	2 Foxglove Close, Worlingham	0.40	5.60	0.3	0.3
R21	WLP B	1.02	5.46	0.8	0.8
R22	WLP C	0.80	5.48	0.6	0.7

Table Notes:

5.2.34 Predicted concentrations were assessed against the relevant EQS of 125 µg/m^3.Predicted 99.73%ile 1-hour mean SO_2 concentrations are summarised in Table 34.

Table 34 Predicted 99.73%ile 1-Hour Mean SO_2 Concentrations

Receptor		1-Hour Mean Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.05	4.49	0.0	0.0
R2	Truck and Plant Engineering	0.39	4.83	0.1	0.1
R3	Denmans	1.89	6.33	0.5	0.5
R4	MH Goals	2.64	7.08	0.8	0.8
R5	M&H Plastics	2.57	7.01	0.7	0.7
R6	WLP A	2.33	7.01	0.7	0.7
R7	Guardwell Coatings	2.41	6.85	0.7	0.7
R8	SEA Scaffolding	1.71	6.15	0.5	0.5
R9	1 Cedar Drive, Worlingham	1.21	6.41	0.3	0.4
R10	The Laurels, Worlingham	1.21	5.61	0.3	0.3
R11	Worlington CEVC Primary School	0.98	5.38	0.3	0.3
R12	Manor Close, Worlingham	1.04	5.44	0.3	0.3
R13	Lowestoft Road	0.65	4.73	0.2	0.2
R14	Gents Farm, Brock Road	0.51	4.39	0.1	0.1
R15	Hill Farm	0.63	4.47	0.2	0.2
R16	Church Road	1.91	5.75	0.5	0.6
R17	Cottage, Cucumber Lane	1.38	6.06	0.4	0.4
R18	21 Oak Lane, Worlingham	0.94	5.62	0.3	0.3
R19	95 Queen Elizabeth Drive, Worlingham	0.82	6.02	0.2	0.2
R20	2 Foxglove Close, Worlingham	0.98	6.18	0.3	0.3
R21	WLP B	2.43	6.87	0.7	0.7
R22	WLP C	1.86	6.54	0.5	0.5

Table Notes: Predicted concentrations were assessed against the relevant EQS of 350 µg/m^3.

5.2.35 Predicted 99.9%ile 15-minute mean SO_2 concentrations are summarised in Table 35.

Table 35 Predicted 99.9%ile 15-Minute Mean SO_2 Concentrations

Receptor		15-Minute Mean Concentration (µg/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.46	4.90	0.2	0.2
R2	Truck and Plant Engineering	1.24	5.68	0.5	0.5
R3	Denmans	4.47	8.91	1.7	1.7
R4	MH Goals	3.98	8.42	1.5	1.5
R5	M&H Plastics	3.99	8.43	1.5	1.5
R6	WLP A	3.80	8.48	1.4	1.5
R7	Guardwell Coatings	3.63	8.07	1.4	1.4
R8	SEA Scaffolding	2.53	6.97	1.0	1.0

Receptor		15-Minute Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R9	1 Cedar Drive, Worlingham	1.74	6.94	0.7	0.7
R10	The Laurels, Worlingham	1.66	6.06	0.6	0.6
R11	Worlington CEVC Primary School	1.37	5.77	0.5	0.5
R12	Manor Close, Worlingham	1.45	5.85	0.5	0.6
R13	Lowestoft Road	0.94	5.02	0.4	0.4
R14	Gents Farm, Brock Road	0.74	4.62	0.3	0.3
R15	Hill Farm	0.96	4.80	0.4	0.4
R16	Church Road	2.87	6.71	1.1	1.1
R17	Cottage, Cucumber Lane	2.03	6.71	0.8	0.8
R18	21 Oak Lane, Worlingham	1.36	6.04	0.5	0.5
R19	95 Queen Elizabeth Drive, Worlingham	1.21	6.41	0.5	0.5
R20	2 Foxglove Close, Worlingham	1.43	6.63	0.5	0.5
R21	WLP B	3.96	8.40	1.5	1.5
R22	WLP C	2.82	7.50	1.1	1.1

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 266 µg/m³.

5.2.36 As indicated in Table 33, Table 34 and Table 35 respectively, predicted 24-hour, 1-hour and 15-minute mean SO_2 concentrations were well below the relevant EQS at all sensitive receptor locations.

5.2.37 The PC proportion of the EQS is less than 10% at all receptor locations for all time periods. As such, impacts on all SO_2 concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20

5.2.38 As such all SO_2 impacts are considered as not significant.

Hydrogen Chloride

5.2.39 Predicted 1-hour mean HCl concentrations are summarised in Table 36.

Table 36 Predicted 1-Hour Mean HCl Concentrations

Receptor		1-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.63	1.51	0.1	0.1
R2	Truck and Plant Engineering	1.24	2.11	0.2	0.2
R3	Denmans	1.19	2.07	0.2	0.2
R4	MH Goals	0.67	1.55	0.1	0.1
R5	M&H Plastics	0.72	1.60	0.1	0.1
R6	WLP A	0.81	1.68	0.1	0.1
R7	Guardwell Coatings	0.73	1.60	0.1	0.1
R8	SEA Scaffolding	0.43	1.31	0.1	0.1
R9	1 Cedar Drive, Worlingham	0.31	1.18	0.0	0.0
R10	The Laurels, Worlingham	0.28	1.15	0.0	0.0

Receptor		1-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R11	Worlington CEVC Primary School	0.30	1.18	0.0	0.0
R12	Manor Close, Worlingham	0.28	1.15	0.0	0.0
R13	Lowestoft Road	0.29	1.16	0.0	0.0
R14	Gents Farm, Brock Road	0.24	1.11	0.0	0.0
R15	Hill Farm	0.28	1.16	0.0	0.0
R16	Church Road	0.48	1.35	0.1	0.1
R17	Cottage, Cucumber Lane	0.35	1.23	0.0	0.0
R18	21 Oak Lane, Worlingham	0.37	1.25	0.0	0.0
R19	95 Queen Elizabeth Drive, Worlingham	0.20	1.07	0.0	0.0
R20	2 Foxglove Close, Worlingham	0.25	1.12	0.0	0.0
R21	WLP B	0.66	1.53	0.1	0.1
R22	WLP C	0.48	1.36	0.1	0.1

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 750 µg/m³.

5.2.40 As indicated in Table 36, predicted 1-hour mean HCl concentrations were well below the relevant EQS at all sensitive receptor locations.

5.2.41 In addition, the PC proportion of the EQS does not exceed 10% at all sensitive receptor locations. As such, impacts on 1-hour mean HCl concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.42 As such all HCl impacts can be considered as not significant.

Hydrogen Fluoride

5.2.43 Predicted annual mean HF concentrations are summarised in Table 37.

Table 37 Predicted Annual Mean HF Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.002	2.002	0.0	12.5
R9	1 Cedar Drive, Worlingham	0.002	2.002	0.0	12.5
R10	The Laurels, Worlingham	0.002	2.002	0.0	12.5
R11	Worlington CEVC Primary School	0.002	2.002	0.0	12.5
R12	Manor Close, Worlingham	0.003	2.003	0.0	12.5
R13	Lowestoft Road	0.002	2.002	0.0	12.5
R14	Gents Farm, Brock Road	0.001	2.001	0.0	12.5
R15	Hill Farm	0.001	2.001	0.0	12.5
R16	Church Road	0.003	2.003	0.0	12.5
R17	Cottage, Cucumber Lane	0.002	2.002	0.0	12.5
R18	21 Oak Lane, Worlingham	0.001	2.001	0.0	12.5
R19	95 Queen Elizabeth Drive, Worlingham	0.001	2.001	0.0	12.5
R20	2 Foxglove Close, Worlingham	0.001	2.001	0.0	12.5

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R21	WLP B	0.004	2.004	0.0	12.5
R22	WLP C	0.002	2.002	0.0	12.5

Table Notes: Predicted concentrations were assessed against the relevant EQS3: 16µg/m³ (monthly average).

5.2.44 Predicted 1-hour mean HF concentrations are summarised in Table 38.

Table 38 Predicted 1-Hour Mean HF Concentrations

Receptor		1-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.13	4.13	0.1	0.1
R2	Truck and Plant Engineering	0.25	4.25	0.2	0.2
R3	Denmans	0.24	4.24	0.1	0.2
R4	MH Goals	0.13	4.13	0.1	0.1
R5	M&H Plastics	0.14	4.14	0.1	0.1
R6	WLP A	0.16	4.16	0.1	0.1
R7	Guardwell Coatings	0.15	4.15	0.1	0.1
R8	SEA Scaffolding	0.09	4.09	0.1	0.1
R9	1 Cedar Drive, Worlingham	0.06	4.06	0.0	0.0
R10	The Laurels, Worlingham	0.06	4.06	0.0	0.0
R11	Worlington CEVC Primary School	0.06	4.06	0.0	0.0
R12	Manor Close, Worlingham	0.06	4.06	0.0	0.0
R13	Lowestoft Road	0.06	4.06	0.0	0.0
R14	Gents Farm, Brock Road	0.05	4.05	0.0	0.0
R15	Hill Farm	0.06	4.06	0.0	0.0
R16	Church Road	0.10	4.10	0.1	0.1
R17	Cottage, Cucumber Lane	0.07	4.07	0.0	0.0
R18	21 Oak Lane, Worlingham	0.07	4.07	0.0	0.0
R19	95 Queen Elizabeth Drive, Worlingham	0.04	4.04	0.0	0.0
R20	2 Foxglove Close, Worlingham	0.05	4.05	0.0	0.0
R21	WLP B	0.13	4.13	0.1	0.1
R22	WLP C	0.10	4.10	0.1	0.1

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 160 µg/m³.

5.2.45 As indicated in Table 37, predicted annual mean HF concentrations were well below the relevant EQS at all sensitive receptor locations.

5.2.46 The PC proportion of the EQS does not exceed 1% at all receptor locations. As such, impacts on annual mean HF concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.47 As indicated in Table 38, predicted 1-hour mean HF concentrations were also below the relevant EQS at all sensitive receptor locations.

5.2.48 The PC proportion of the EQS is less than 10% at all sensitive receptor locations. As such, impacts on 1-hour mean HF concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.49 As such all HF impacts are considered as not significant.

Dioxins and Furans

5.2.50 Predicted PCDD/F concentrations are summarised in Table 39. Impacts on PCDD/F are assessed against the tolerable daily intake of 2000 fg recommended by the COT.

Table 39 Predicted PCDD/F Concentrations

Receptor		Annual Mean Concentration (fg/m^3)		1-Hour Mean Concentration (fg/m^3)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.00	17.78	4.25	39.80
R2	Truck and Plant Engineering	0.01	17.79	8.30	43.85
R3	Denmans	0.11	17.88	8.00	43.55
R4	MH Goals	0.30	18.08	4.53	40.08
R5	M&H Plastics	0.20	17.98	4.85	40.40
R6	WLP A	0.07	17.85	5.43	40.98
R7	Guardwell Coatings	0.17	17.95	4.89	40.44
R8	SEA Scaffolding	0.21	17.99	2.92	38.47
R9	1 Cedar Drive, Worlingham	0.06	17.84	2.05	37.60
R10	The Laurels, Worlingham	0.08	17.86	1.87	37.42
R11	Worlington CEVC Primary School	0.07	17.85	2.01	37.56
R12	Manor Close, Worlingham	0.10	17.87	1.87	37.42
R13	Lowestoft Road	0.06	17.83	1.92	37.47
R14	Gents Farm, Brock Road	0.04	17.82	1.59	37.14
R15	Hill Farm	0.03	17.80	1.89	37.44
R16	Church Road	0.10	17.87	3.20	38.75
R17	Cottage, Cucumber Lane	0.07	17.84	2.36	37.91
R18	21 Oak Lane, Worlingham	0.04	17.81	2.49	38.04
R19	95 Queen Elizabeth Drive, Worlingham	0.03	17.80	1.33	36.88
R20	2 Foxglove Close, Worlingham	0.04	17.81	1.65	37.20
R21	WLP B	0.13	17.91	4.42	39.97
R22	WLP C	0.07	17.85	3.25	38.80

5.2.51 As indicated in Table 39, the maximum modelled annual mean PC for PCDD/Fs associated with the operation of the proposed facility was 0.10 fg/m^3 and maximum 1-hour mean PC for PCDD/Fs concentration is 8.30 fg/m^3. This is not expected to significantly increase the airborne concentration or deposition rate of PCDD/Fs above that already experienced in the area.

5.2.52 Her Majesty's Inspectorate of Pollution (HMIP) 'Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes' identifies that the main human exposure pathway of PCDD/Fs is 'inhalation of air'. As such, this was identified as the key hazard for the Human Health Risk Assessment.

5.2.53 As indicated in Table 39, the maximum predicted 1-hour mean PC for PCDD/Fs concentration is 8.30 fg/m^3. This means that assuming the maximum hourly PC throughout the whole day, an average body mass of 70 kg, a worst-case adult breathing rate of 20 m^3/day and assuming that all PCDD/Fs inhaled are absorbed by the individual (i.e. none are exhaled), the uptake of PCDD/Fs via inhalation is estimated to be 2.37 fg WHO-TEQ/kg bw per day which is 0.12% of the tolerable daily intake of 2000 fg recommended by the Committee on Toxicity Of Chemicals in Food, Consumer Products and the Environment (COT).

5.2.54 The potential effects of dioxins released by the proposed facility can therefore be considered negligible and therefore a not significant risk to human health.

Cadmium

5.2.55 Predicted annual mean Cd concentrations are summarised in Table 40.

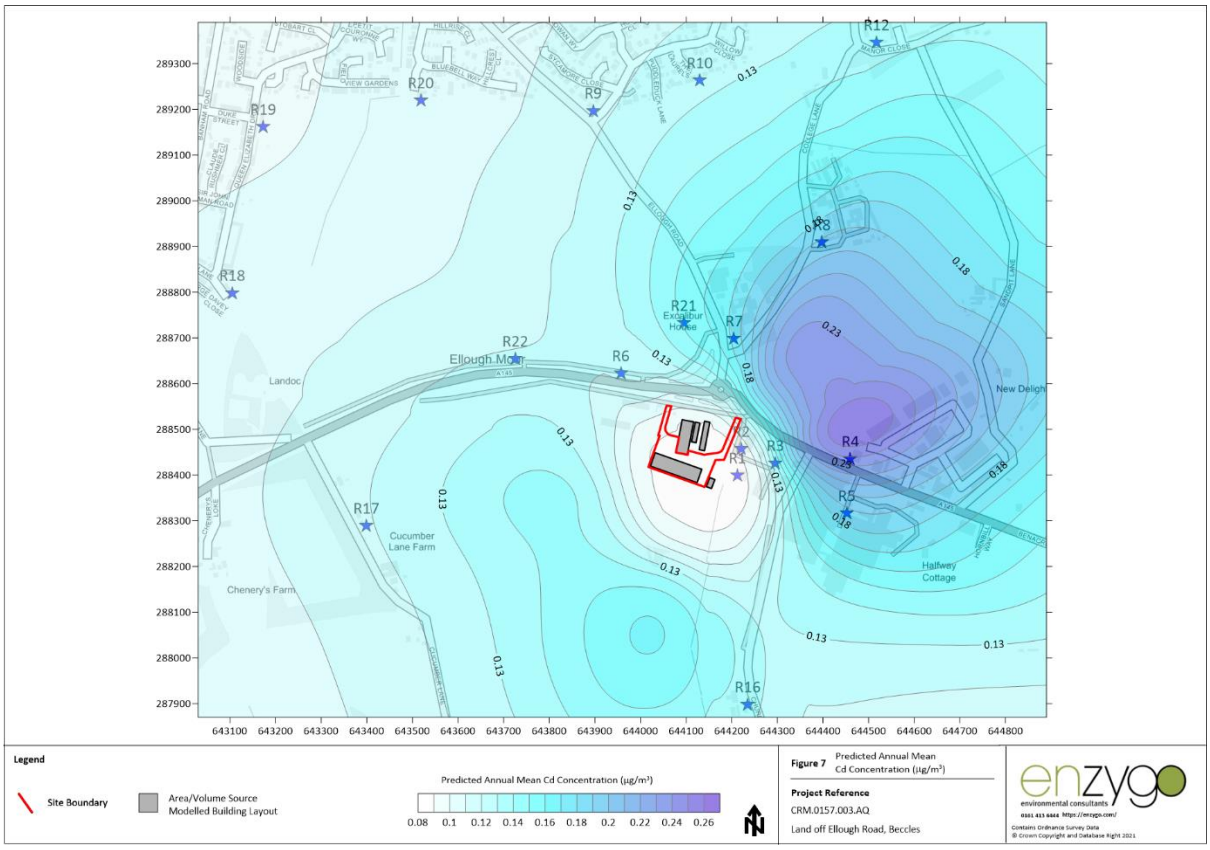
Table 40 Predicted Annual Mean Cd Concentrations

Receptor		Annual Mean Concentration (ng/m^3)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.04	0.12	0.7	2.4
R9	1 Cedar Drive, Worlingham	0.03	0.12	0.6	2.4
R10	The Laurels, Worlingham	0.04	0.13	0.8	2.5
R11	Worlington CEVC Primary School	0.04	0.12	0.7	2.4
R12	Manor Close, Worlingham	0.05	0.14	1.0	2.7
R13	Lowestoft Road	0.03	0.11	0.6	2.3
R14	Gents Farm, Brock Road	0.02	0.11	0.4	2.2
R15	Hill Farm	0.01	0.10	0.3	2.0
R16	Church Road	0.05	0.13	1.0	2.7
R17	Cottage, Cucumber Lane	0.03	0.12	0.7	2.4
R18	21 Oak Lane, Worlingham	0.02	0.10	0.4	2.1
R19	95 Queen Elizabeth Drive, Worlingham	0.01	0.10	0.3	2.0
R20	2 Foxglove Close, Worlingham	0.02	0.10	0.4	2.1
R21	WLP B	0.06	0.15	1.3	3.0
R22	WLP C	0.04	0.12	0.7	2.4

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 5 ng/m^3.

5.2.56 As indicated in Table 40 and Figure 7, predicted maximum annual mean Cd concentrations were well below the relevant EQS at all sensitive receptor locations.

Figure 7 Annual Mean Cadmium Concentrations



5.2.57 The PC proportion of the EQS is not below 1.0% at 3 receptor location (R12, R16 and R21). However, the impacts are considered insignificant at the second stage of the EA screening as the PEC proportion is well below 70% of the EQS. Impacts on annual mean Cd concentrations are therefore screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.58 As such all Cd impacts are considered as not significant.

Mercury

5.2.59 Predicted annual mean Hg concentrations are summarised in Table 41.

Table 41 Predicted Annual Mean Hg Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R6	WLP A	0.000	0.001	0.0	0.3
R9	1 Cedar Drive, Worlingham	0.000	0.001	0.0	0.3
R10	The Laurels, Worlingham	0.000	0.001	0.0	0.3
R11	Worlington CEVC Primary School	0.000	0.001	0.0	0.3
R12	Manor Close, Worlingham	0.000	0.001	0.0	0.3
R13	Lowestoft Road	0.000	0.001	0.0	0.3
R14	Gents Farm, Brock Road	0.000	0.001	0.0	0.3
R15	Hill Farm	0.000	0.001	0.0	0.3
R16	Church Road	0.000	0.001	0.0	0.3
R17	Cottage, Cucumber Lane	0.000	0.001	0.0	0.3

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R18	21 Oak Lane, Worlingham	0.000	0.001	0.0	0.3
R19	95 Queen Elizabeth Drive, Worlingham	0.000	0.001	0.0	0.3
R20	2 Foxglove Close, Worlingham	0.000	0.001	0.0	0.3
R21	WLP B	0.000	0.001	0.0	0.3
R22	WLP C	0.000	0.001	0.0	0.3

Table Notes:
Predicted concentrations were assessed against the relevant EQS of 0.25 µg/m³.

5.2.60 Predicted 1-hour mean Hg concentrations are summarised in Table 42.

Table 42 Predicted 1-Hour Mean Hg Concentrations

Receptor		1-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
R1	Wagg Motor Engineers	0.002	0.003	0.0	0.0
R2	Truck and Plant Engineering	0.004	0.005	0.1	0.1
R3	Denmans	0.004	0.005	0.1	0.1
R4	MH Goals	0.002	0.004	0.0	0.0
R5	M&H Plastics	0.002	0.004	0.0	0.0
R6	WLP A	0.003	0.004	0.0	0.0
R7	Guardwell Coatings	0.002	0.004	0.0	0.0
R8	SEA Scaffolding	0.001	0.003	0.0	0.0
R9	1 Cedar Drive, Worlingham	0.001	0.002	0.0	0.0
R10	The Laurels, Worlingham	0.001	0.002	0.0	0.0
R11	Worlington CEVC Primary School	0.001	0.002	0.0	0.0
R12	Manor Close, Worlingham	0.001	0.002	0.0	0.0
R13	Lowestoft Road	0.001	0.002	0.0	0.0
R14	Gents Farm, Brock Road	0.001	0.002	0.0	0.0
R15	Hill Farm	0.001	0.002	0.0	0.0
R16	Church Road	0.002	0.003	0.0	0.0
R17	Cottage, Cucumber Lane	0.001	0.003	0.0	0.0
R18	21 Oak Lane, Worlingham	0.001	0.003	0.0	0.0
R19	95 Queen Elizabeth Drive, Worlingham	0.001	0.002	0.0	0.0
R20	2 Foxglove Close, Worlingham	0.001	0.002	0.0	0.0
R21	WLP B	0.002	0.004	0.0	0.0
R22	WLP C	0.002	0.003	0.0	0.0

Table Notes:
Predicted concentrations were assessed against the relevant EQSs: 1-hour mean EQS of 7.5 µg/m³.

5.2.61 As indicated in Table 41, predicted annual mean Hg concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.62 The PC proportion of the EQS does not exceed 1% at all receptor locations sensitive to long-term exposure. As such, impacts on annual mean Hg concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.63 As indicated in Table 42, predicted 1-hour mean Hg concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.64 The PC proportion of the EQS is less than 10% at all sensitive receptor locations. As such, impacts on 1-hour mean Hg concentrations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.2.65 As such all Hg impacts are considered as not significant.

Group 3 Metals

5.2.66 The predicted maximum long and short-term trace metal impacts at sensitive receptors for emissions at maximum SWIP draft process guidance limits are presented in Tables and respectively. For all metals the maximum concentrations were predicted at receptor R5.

5.2.67 For the group 3 metals (Sb, As, Pb, Cr, Cu, Ni and V), if both the long- and short-term PECs are within the relevant EQSs, then the impact is considered insignificant, in accordance with the Environment Agency's metals guidance.

Table 43 Maximum Group 3 Metal Predictions

Metal	Period	Unit	Predicted Concentration		Proportion of EQS (%)	
			PC	PEC	PC	PEC
Pb	Annual Mean	µg/m^3	0.00	0.00	0.3	1.9
As	Annual Mean	ng/m^3	0.65	1.19	10.8	19.9
Ni	Annual Mean	ng/m^3	0.65	1.18	3.2	5.9
Sb	Annual Mean	µg/m^3	0.00	0.00	0.0	0.0
	1-Hour Mean	µg/m^3	0.04	0.04	0.0	0.0
Cr	Annual Mean	µg/m^3	0.00	0.00	258.3	289.7
	1-Hour Mean	µg/m^3	0.04	0.04	0.0	0.0
Cu	Annual Mean	µg/m^3	0.00	0.00	0.0	0.0
	1-Hour Mean	µg/m^3	0.04	0.04	0.0	0.0
Mn	Annual Mean	µg/m^3	0.00	0.00	0.4	2.0
	1-Hour Mean	µg/m^3	0.04	0.05	0.0	0.5
V	Annual Mean	µg/m^3	0.00	0.00	0.0	0.0
	1-Hour Mean	µg/m^3	0.04	0.04	4.1	4.3

5.2.68 As shown in Table 43 the PC exceeded 1% of the long term EQS for As, Ni, Cr and V. However only the PEC for Cr emissions exceeded the EQS and as such all other group 3 metals impacts can be screened as insignificant.

5.2.69 This initial assessment assumes a worst case where Cr emissions are at the permitted limit for total group 3 metals, consist entirely of Cr and that proportion comprises entirely the most harmful hexavalent: Chromium compounds (Cr(VI)).

5.2.70 The EA guidance on group 3 metals emissions assessment[8] advises that where a group 3 metal cannot be screened out as insignificant as above then a second stage assessment is required.

5.2.71 As such, the *maximum* emissions data listed within Appendix A of the EA document[8] was used to assess the impacts of Cr(VI) emissions. This is given as 0.03% of the group 3 metals limit used in this assessment. These emissions data are based upon monitoring data at municipal Waste Incinerators and Waste Wood Co-incinerators within England and Wales. In line with the EA

document, the Cr (VI) background concentration comprises 20% of the total background Cr concentration.

5.2.72 Predicted maximum annual mean Cr (VI) concentrations at a sensitive receptor is summarised in Table 44.

Table 44 Maximum Cr (VI) Predictions

Metal	Period	Unit	Predicted Concentration		Proportion of EQS (%)	
			PC	PEC	PC	PEC
Cr (VI)	Annual Mean	µg/m^3	0.00000045	0.0001	0.23	39.5

5.2.73 As indicated in Table 44, the maximum predicted Cr (VI) PC concentrations at a sensitive receptor is well below 100% of the PEC and therefore impacts can be screened out as insignificant.

5.2.74 As such all group 3 metal impacts including Cr (VI) are considered not significant.

5.3 Short-Term Emissions Scenario

5.3.1 The impacts of half hourly emissions limits have been predicted for all short term EQS (less than 24 hours). The results for the maximum impact at a sensitive receptor are summarised in Table 45. Note that the half hourly emissions limits are only given for those pollutants listed in Table 8.

Table 45 Maximum Short-Term Emissions Impacts

Pollutant	Period	Receptor	Concentration (µg/m^3)		Proportion of EQS (%)	
			PC	PEC	PC	PEC
NO_2	1-hour mean	R4	7.63	26.39	3.8	15
CO	8-hour rolling mean	R4	5.03	475.0	0.1	0.1
HCl	1 hour mean	R2	7.41	8.29	1.0	1.0
HF	1 hour mean	R2	0.49	4.49	0.3	0.3
SO_2	15-minute mean	R3	17.86	22.3	6.7	6.8
	1 hour mean	R4	10.56	15.00	3.0	3.1

5.3.2 As indicated in Table 45 predicted all short-term emissions concentrations were below the relevant EQS at all sensitive receptor locations.

5.3.3 The PC proportion of the EQS is less than 10% at all sensitive receptor locations and as such, impacts on short term concentrations for all relevant pollutants can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.4 Ecological Receptors

Oxides of Nitrogen

5.4.1 Predicted annual mean NO_x concentrations at sensitive ecological receptors are summarised in Table 46.

Table 46 Predicted Annual Mean NOx Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.1	11.3	0.2	37.6
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.1	11.3	0.2	37.6
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.1	11.3	0.2	37.6
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0	11.6	0.1	38.8
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.0	11.6	0.1	38.8
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0	11.9	0.1	39.7
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0	11.9	0.1	39.8
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0	11.9	0.1	39.8
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.0	10.7	0.0	35.7
ER10	Sotterley Park (SSSI)	0.0	9.6	0.1	32.1
ER11	Sotterley Park (SSSI)	0.0	9.6	0.1	32.1
ER12	Sotterley Park (SSSI)	0.0	9.6	0.1	32.1
ER13	Titsal Wood, Shadingfield (SSSI)	0.0	9.2	0.1	30.8
ER14	Pakefield to Easton Bavents SSSI	0.0	10.4	0.0	34.7
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0	9.2	0.0	30.7
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0	9.2	0.0	30.7
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0	9.2	0.0	30.7
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0	9.2	0.0	30.7
ER20	Ellough Airfield (CWS)	0.2	12.3	0.6	40.9
ER21	Ellough Churchyard	0.1	9.7	0.2	32.2
ER22	Scarls Grove	0.1	10.1	0.4	33.5
ER23	Ellough Grove	0.1	10.0	0.2	33.4

5.4.2 Predicted 24-hour mean NO_x concentrations are summarised in Table 47.

Table 47 Predicted 24-Hour Mean NOx Concentrations

Receptor		24-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.47	22.91	0.6	30.6
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.49	22.93	0.7	30.6

Receptor		24-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.58	23.02	0.8	30.7
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.30	23.50	0.4	31.3
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.23	23.43	0.3	31.2
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.39	24.19	0.5	32.3
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.37	24.17	0.5	32.2
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.35	24.15	0.5	32.2
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.25	21.65	0.3	28.9
ER10	Sotterley Park (SSSI)	0.39	19.59	0.5	26.1
ER11	Sotterley Park (SSSI)	0.45	19.65	0.6	26.2
ER12	Sotterley Park (SSSI)	0.41	19.61	0.6	26.2
ER13	Titsal Wood, Shadingfield (SSSI)	0.35	18.75	0.5	25.0
ER14	Pakefield to Easton Bavents SSSI	0.16	20.96	0.2	27.9
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.17	18.57	0.2	24.8
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.16	18.56	0.2	24.7
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.18	18.58	0.2	24.8
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.16	18.56	0.2	24.7
ER20	Ellough Airfield (CWS)	1.57	25.77	2.1	34.4
ER21	Ellough Churchyard (CWS)	1.10	20.30	1.5	27.1
ER22	Scarls Grove (CWS)	0.93	20.83	1.2	27.8
ER23	Ellough Grove (CWS)	0.66	20.56	0.9	27.4

5.4.3 As indicated in Table 46, predicted annual mean NOx concentrations were below the relevant EQS at all sensitive receptor locations.

5.4.4 The PC proportion of the EQS does not exceed of 1% at any SAC/SSSI designations or 100% at all CWS receptor locations. As such, impacts on annual mean NO_X concentrations at all locations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.4.5 As indicated in Table 47, predicted 24-hour mean NOx concentrations were below the relevant EQS at all sensitive receptor locations.

5.4.6 The PC proportion of the EQS does not exceed 10% at all SSSI receptor locations. Additionally, the PC proportion of the EQS is less than 100% at all CWS receptor locations. As such, impacts on 24-hour mean NOx concentrations at all ecological receptors can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.4.7 All impacts on NOx concentrations can therefore be considered to be not significant.

Sulphur Dioxide

5.4.8 Predicted annual mean SO_2 concentrations are summarised in Table 48.

Table 48 Predicted Annual Mean SO_2 Concentrations

Receptor		Annual Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.01	1.47	0.1	14.7
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.02	1.48	0.2	14.8
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.01	1.47	0.1	14.7
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.01	1.01	0.1	10.1
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.01	1.01	0.1	10.1
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.01	1.31	0.1	13.1
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.01	1.31	0.1	13.1
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.01	1.31	0.1	13.1
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.00	1.00	0.0	10.0
ER10	Sotterley Park (SSSI)	0.01	1.01	0.1	10.1
ER11	Sotterley Park (SSSI)	0.01	1.01	0.1	10.1
ER12	Sotterley Park (SSSI)	0.01	1.01	0.1	10.1
ER13	Titsal Wood, Shadingfield (SSSI)	0.01	0.91	0.1	9.1
ER14	Pakefield to Easton Bavents SSSI	0.00	0.90	0.0	9.0
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	0.60	0.0	6.0
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	0.60	0.0	6.0
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	0.60	0.0	6.0
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	0.60	0.0	6.0
ER20	Ellough Airfield (CWS)	0.04	2.50	0.4	25.0
ER21	Ellough Churchyard (CWS)	0.02	1.31	0.2	13.1
ER22	Scarls Grove (CWS)	0.03	1.55	0.3	15.5
ER23	Ellough Grove (CWS)	0.02	1.54	0.2	15.4

5.4.9 As indicated in Table 48, predicted annual mean SO_2 concentrations were below the relevant EQS at all sensitive receptor locations.

5.4.10 In addition, the PC proportion of the EQS does not exceed of 1% at any SAC/SSSI designations or 100% at all CWS/LNR receptor locations and impacts on annual mean SO_2 concentrations at all sites can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.4.11 As such all impacts on SO_2 concentrations can be considered to be not significant.

Hydrogen Fluoride

5.4.12 Predicted weekly mean HF concentrations are summarised in Table 49.

Table 49 Predicted Weekly Mean HF Concentrations

Receptor		Weekly Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.002	4.002	0.4	800.4
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.002	4.002	0.5	800.5
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.002	4.002	0.4	800.4
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.001	4.001	0.2	800.2
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.001	4.001	0.2	800.2
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.002	4.002	0.4	800.4
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.002	4.002	0.4	800.4
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.002	4.002	0.3	800.3
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.001	4.001	0.1	800.1
ER10	Sotterley Park (SSSI)	0.001	4.001	0.2	800.2
ER11	Sotterley Park (SSSI)	0.002	4.002	0.3	800.3
ER12	Sotterley Park (SSSI)	0.002	4.002	0.3	800.3
ER13	Titsal Wood, Shadingfield (SSSI)	0.002	4.002	0.4	800.4
ER14	Pakefield to Easton Bavents SSSI	0.001	4.001	0.1	800.1
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.001	4.001	0.1	800.1
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.000	4.000	0.1	800.1
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.001	4.001	0.1	800.1
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.001	4.001	0.1	800.1
ER20	Ellough Airfield (CWS)	0.006	4.006	1.2	801.2
ER21	Ellough Churchyard (CWS)	0.007	4.007	1.4	801.4
ER22	Scarls Grove (CWS)	0.004	4.004	0.7	800.7
ER23	Ellough Grove (CWS)	0.003	4.003	0.6	800.6

5.4.13 Predicted 24-hour mean HF concentrations are summarised in Table 50.

Table 50 Predicted 24-Hour Mean HF Concentrations

Receptor		24-Hour Mean Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.01	4.01	0.1	80.1
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.0	80.0
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.00	4.00	0.1	80.1
ER10	Sotterley Park (SSSI)	0.00	4.00	0.1	80.1
ER11	Sotterley Park (SSSI)	0.00	4.00	0.1	80.1
ER12	Sotterley Park (SSSI)	0.00	4.00	0.1	80.1
ER13	Titsal Wood, Shadingfield (SSSI)	0.00	4.00	0.1	80.1
ER14	Pakefield to Easton Bavents SSSI	0.00	4.00	0.0	80.0
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	4.00	0.0	80.0
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	4.00	0.0	80.0
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	4.00	0.0	80.0
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	4.00	0.0	80.0
ER20	Ellough Airfield (CWS)	0.02	4.02	0.3	80.3
ER21	Ellough Churchyard (CWS)	0.01	4.01	0.2	80.2
ER22	Scarls Grove (CWS)	0.01	4.01	0.2	80.2
ER23	Ellough Grove (CWS)	0.01	4.01	0.1	80.1

5.4.14 As indicated in Table 49, predicted weekly mean HF concentrations were above the relevant EQS at all ecological receptor locations. This is due to the background concentration of 4 µg/m³, which exceeds the EQS as a base condition.

5.4.15 The PC proportion of the EQS does not exceed of 1% at any SAC/SSSI designations or 100% at all CWS/LNR receptor locations. As such, impacts on weekly mean HF concentrations at all locations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.4.16 As indicated in Table 50, predicted 24-hour mean HF concentrations were below the relevant EQS at all sensitive receptor locations.

5.4.17 In addition, The PC proportion of the EQS does not exceed of 10% at any SAC/SSI designations or 100% at all CWS/LNR receptor locations. As such, impacts on 24-hour mean HF concentrations at all locations can be screened out as insignificant according to the criteria detailed in Section 3.20.

5.4.18 As such all impacts on SO_2 concentrations can be considered to be not significant.

Nitrogen Deposition

5.4.19 Predicted annual mean nitrogen deposition rates are summarised in Table 51.

Table 51 Predicted Annual Mean Nitrogen Deposition Rates

Receptor		Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
				Low EQS		High EQS	
		PC	PEC	PC	PEC	PC	PEC
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.01	15.31	0.2	306.2	0.1	102.1
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.01	15.31	0.2	306.2	0.1	102.1
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.01	15.31	0.2	306.2	0.1	102.1
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	13.90	0.1	278.1	0.0	92.7
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.00	13.90	0.1	278.1	0.0	92.7
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	16.70	0.1	334.1	0.0	111.4
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	16.70	0.1	334.1	0.0	111.4
ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.00	16.70	0.1	334.1	0.0	111.4
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.00	17.00	0.0	340.0	0.0	113.3
ER10	Sotterley Park (SSSI)	0.00	27.40	0.1	548.1	0.0	182.7
ER11	Sotterley Park (SSSI)	0.00	27.40	0.1	548.1	0.0	182.7
ER12	Sotterley Park (SSSI)	0.00	27.40	0.1	548.1	0.0	182.7
ER13	Titsal Wood, Shadingfield (SSSI)	0.00	28.70	0.0	574.1	0.0	191.4
ER14	Pakefield to Easton Bavents SSSI	0.00	12.80	0.0	256.0	0.0	85.3
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	12.60	0.0	252.0	0.0	84.0
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	12.60	0.0	252.0	0.0	84.0

Receptor		Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
				Low EQS		High EQS	
		PC	PEC	PC	PEC	PC	PEC
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0014	12.90	0.0	258.0	0.0	86.0
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.00	13.10	0.0	262.0	0.0	87.3
ER20	Ellough Airfield (CWS)	0.03	15.82	0.5	316.3	0.2	105.4
ER21	Ellough Churchyard (CWS)	0.01	16.10	0.2	322.0	0.1	107.3
ER22	Scarls Grove (CWS)	0.02	15.85	0.3	316.9	0.1	105.6
ER23	Ellough Grove (CWS)	0.01	28.03	0.1	560.6	0.1	186.9

5.4.20 As indicated in Table 51, predicted annual mean nitrogen deposition rates were above both the low and high EQSs at all sensitive receptor locations. This is due to the high background deposition rates, which exceed the EQSs as a base condition.

5.4.21 The PC proportion of the EQS does not exceed of 1% at any statutory designations or 100% at all CWS receptor locations. As such, impacts on annual mean N deposition at all locations can be screened out as insignificant according to the criteria detailed in Section 3.20.

Acid Deposition

5.4.22 Predicted annual mean acid deposition rates are summarised in Table 52. In accordance with the EA guidance 'Air emissions risk assessment for your environmental permit', the APIS site relevant critical load tool was used to determine whether there is an exceedance of the CL function for acid deposition. HCl impact contributions were included in the S acid deposition PC in line with APIS guidance.

Table 52 Predicted Annual Mean Acid Deposition Rates

Receptor		Annual Mean Acid Deposition Rate (keq/ha/yr)		Proportion of critical load function (%)		PC Screening Threshold (%)
		S	N	PC	PEC	
ER1	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.0024	0.0006	0.6	248	1
ER2	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.0028	0.0007	0.7	248	1
ER3	Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI)	0.0024	0.0006	0.6	248	1
ER4	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0012	0.0003	0.3	224	1
ER5	Broadland, The Broads, Stanley and Alder Carrs, Aldeby (RAMSAR, SPA, SAC, SSSI)	0.0010	0.0003	0.3	224	1
ER6	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0016	0.0002	0.4	316	1
ER7	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0018	0.0003	0.4	316	1

ER8	Broadland, The Broads, Sprat's Water and Marshes, Carlton Colville (RAMSAR, SPA, SAC, SSSI)	0.0018	0.0003	0.4	316	1
ER9	Broadland, The Broads, Sprat's Water and Marshes, Geldeston Meadows (RAMSAR, SPA, SAC, SSSI)	0.0008	0.0001	0.2	318	1
ER10	Sotterley Park (SSSI)	0.0020	0.0002	0.4	156	1
ER11	Sotterley Park (SSSI)	0.0019	0.0002	0.4	156	1
ER12	Sotterley Park (SSSI)	0.0020	0.0002	0.4	156	1
ER13	Titsal Wood, Shadingfield (SSSI)	0.0023	0.0003	0.1	80	1
ER14	Pakefield to Easton Bavents SSSI	0.0006	0.0002	0.0	21	1
ER15	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0010	0.0001	0.0	20	1
ER16	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0009	0.0001	0.0	20	1
ER17	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0004	0.0001	0.0	21	1
ER18	Benacre to Easton Bavents (SPA, SAC, SSSI)	0.0003	0.0001	0.0	20	1
ER20	Ellough Airfield (CWS)	0.0072	0.0018	0.4	57	100
ER21	Ellough Churchyard (CWS)	0.0063	0.0008	1.0	182	100
ER22	Scarls Grove (CWS)	0.0043	0.0011	0.2	57	100
ER23	Ellough Grove (CWS)	0.0028	0.0007	0.1	79	100

5.4.23 As shown in Table 52 the APIS site relevant critical load tool indicated that no receptors exceeded the relevant screening threshold for acid deposition. As such, impacts on annual mean acid deposition at all locations can be screened out as insignificant according to the criteria detailed in Section 3.20

5.4.24 It is noted that the acid critical load is currently exceeded as a baseline condition at all receptors.

5.4.25 As stated in Section 3.8 no critical loads are given for receptors ER10 to ER12 at Sotterley Park SSSI and in these locations the baseline depositions were assumed to represent the critical load.

5.5 In Combination Effects

5.5.1 A search of new permitted sites or live applications (from 1st January 2020) within 5 km of the ecological sites and with the potential to emit ammonia has been undertaken by reviewing the planning portals from the planning authorities in the area.

5.5.2 This included developments that have the potential to generate significant traffic on main roads within 200 m of a designation. For the purposes of this assessment this required consideration of impacts on the A146 Beccles Road affecting Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI).

5.5.3 The review focussed on proposals where emissions were considered potentially significant and air quality assessments were deemed necessary. The planning review considered applications to East Suffolk District Council, South Norfolk District Council and Suffolk County Council. The results of this review are as shown below.

South Norfolk District Council

5.5.4 No relevant live or recent applications.

Suffolk County Council

5.5.5 Planning reference SCC/0124/22W. Land at Copeland Way, Ellough, Beccles, NR34 7TL. Construction and operation of anaerobic digestion plant and associated infrastructure. Application Pending a Decision.

5.5.6 This application has been accompanied by an air quality assessment[10] which considered the magnitude of impacts on nearby ecological designations. Therefore it was considered necessary and feasible to include these impacts in the in-combination assessment.

East Suffolk District Council

5.5.7 Planning Reference DC/21/0249/FUL. Church Farm, London Road, Shadingfield, NR34 8DF. The provision of two replacement biomass boilers, stacks and associated equipment within the site area edged red and with access AB thereto (see location plan). Permission Granted.

5.5.8 This application has been accompanied by an air quality assessment[11] which considered the magnitude of impacts on nearby ecological designations. Therefore it was considered necessary and feasible to include these impacts in the in-combination assessment.

5.5.9 A review of the Copeland Way and Church Farm air quality assessments and the expected pollutant emissions showed that combined impacts of NOx and SO_2 concentrations and nitrogen and acid deposition were required.

5.5.10 The same distinct receptor locations are not used in the different development air quality assessments and therefore nearest receptor location to that used in the proposed development assessment was selected. It is possible that there may be some small differences in the background and critical loads used in the assessments due to receptor locations, data resolutions and updates.

5.5.11 Where there are no predictions at a designation an impact estimated at a location at a similar distance from the emission source was used. Therefore it is important to note that such impacts are estimates rather than predictions.

5.5.12 The maximum impact from each source at the designation (nearest or most sensitive) are set out in the sections below. The corresponding PEC at the location of the maximum PC has been listed.

In-Combination Oxides of Nitrogen

5.5.13 The maximum annual mean NOx impacts of the proposed and in-combination developments at each are shown in Table 53.

Table 53 In Combination Maximum Annual Mean NOx Impacts

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)	Church Farm PC/EQS (%)	Combined PC/EQS (%)	Combined PEC/EQS (%)
Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC (& SSSI components)	0.2	0.4	0.0	0.7	37.6
Sotterley Park (SSSI)	0.1	0.3	0.2	0.5	32.5
Titsal Wood, Shadingfield (SSSI)	0.1	0.1	1.6	1.8	32.5

[10] Air Quality and Odour Impact Assessment to Support a Planning Application for an AD facility at Copland Way. Earthcare Technical. February 2022.
[11] An Assessment using Dispersion Modelling of the Impact of Airborne Emissions from the Proposed Biomass Boilers at Church Farm, London Road, near Shadingfield in Suffolk. AS Modelling & Data. January 2021

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)	Church Farm PC/EQS (%)	Combined PC/EQS (%)	Combined PEC/EQS (%)
Pakefield to Easton Bavents (SSSI)	0.0	0.1	0.0	0.1	34.8
Benacre to Easton Bavents (SPA, SAC (& SSSI components)	0.0	0.1	0.0	0.1	30.8

5.5.14 The maximum 24-hour mean NOx impacts of the proposed and in-combination developments are shown in Table 54.

Table 54 In Combination Maximum 24-Hour Mean NOx Impacts

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)	Church Farm PC/EQS (%)	Combined PC/EQS (%)	Combined PEC/EQS (%)
Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC (& SSSI components)	0.8	3.5	0.3	4.4	35.2
Sotterley Park (SSSI)	0.6	3.2	0.2	4.5	30.9
Titsal Wood, Shadingfield (SSSI)	0.5	2.0	9.8	**12.2**	37.4
Pakefield to Easton Bavents (SSSI)	0.2	1.1	0.0	1.3	29.3
Benacre to Easton Bavents (SPA, SAC (& SSSI components)	0.2	1.1	0.0	1.3	26.1

5.5.15 Table 53 shows that the NOx annual mean in-combination impact at all RAMSAR, SAC and SPA designations is below 1% of the EQS and below 4% at all SSSIs. As such all in-combination impacts are considered not significant. Where the PC proportion of the EQS is greater than 1% at Titsal Wood SSSI the predominant contributor to this is the Church Farm development and the proposed development and Copeland was are insignificant.

5.5.16 Short term impacts are usually screened against 10% thresholds. Table 54 shows that the 24-hour mean impacts exceed the EQS proportion of 10% at Titsal Wood. Similarly to annual mean impacts, this is predominantly due to the Church Farm impacts and to a lesser extent, impacts from Copeland Way.

5.5.17 All predicted PECs are well below all NOx concentration critical levels and all impacts are considered as not significant.

In-Combination Sulphur Dioxide

5.5.18 The maximum annual mean SO_2 impacts of the proposed and in-combination developments are shown in Table 55.

Table 55 In Combination Maximum Annual Mean SO_2 Impacts

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)*	Church Farm PC/EQS (%)	Combined PC/EQS (%)*	Combined PEC/EQS (%)
Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC (& SSSI components)	0.2	0.1	None	0.3	49.7
Sotterley Park (SSSI)	0.1	0.2	None	0.2	30.9
Titsal Wood, Shadingfield (SSSI)	0.1	0.0	None	0.1	30.4
Pakefield to Easton Bavents SSSI	0.0	0.0	None	0.0	30.3

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)*	Church Farm PC/EQS (%)	Combined PC/EQS (%)*	Combined PEC/EQS (%)
Benacre to Easton Bavents (SPA, SAC (& SSSI components)	0.0	0.0	None	0.0	26.1

* Copeland Way levels calculated from S acid deposition loads

5.5.19 Table 55 indicates that all in-combination impacts are below the relevant threshold at all designations, as such all in combination SO_2 impacts are considered as not significant.

5.5.20 Furthermore, all predicted PECs are well below all SO_2 concentration critical level of 10 $\mu g/m^3$.

In Combination Nitrogen Deposition

5.5.21 The maximum annual mean N deposition impacts of the proposed and in-combination developments are shown in Table 56.

Table 56 In Combination Maximum Annual Mean N Deposition Impacts

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)	Church Farm PC/EQS (%)*	Combined PC/EQS (%)	Combined PEC/EQS (%)
Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC (& SSSI components)	0.2	**3.3**	0.0	**3.5**	313.1
Sotterley Park (SSSI) ER10, ER11, ER12	0.1	**3.9**	0.3	4.4	553.5
Titsal Wood, Shadingfield (SSSI)	0.0	0.4	0.9	1.4	579.6
Pakefield to Easton Bavents (SSSI)	0.0	0.7	0.0	0.8	257.5
Benacre to Easton Bavents (SPA, SAC (& SSSI components)	0.0	0.6	0.0	0.7	259.1

* Church Farm nitrogen deposition not shown in report and were calculated from stated NOx impacts

5.5.22 Table 56 indicates that the in-combination impacts exceed the 1% threshold at the Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC, SSSI) designation. However, the proposed development impacts are shown to be insignificant in comparison to the potentially significant impacts of other developments.

5.5.23 As stated previously it is Natural England's view that "*care should be taken to avoid unnecessarily combining the insignificant effects of the subject plan or project with the effects of other plans or projects which can be considered significant in their own right".* In such circumstances the HRA should focus on the potentially significant impacts individually.

5.5.24 Where the PC proportion of the EQS is greater than 1% at Sotterley Park and Titsal Wood SSSIs the predominant contributor to this are the other included developments and the Proposed Development impacts are insignificant.

5.5.25 In addition, the Proposed Development is based on permitted emission limits and actual emissions are likely to be lower than those assessed in this report.

5.5.26 As such the in-combination assessment does not indicate that N deposition impacts from the Proposed Development can be considered as significant.

In Combination Acid Deposition

5.5.27 The maximum annual mean acid deposition impacts of the proposed and in-combination developments are shown in Table 57.

Table 57 In Combination Maximum Annual Mean Acid Deposition Impacts

Location / Receptors	Development PC/EQS (%)	Copeland Way PC/EQS (%)	Church Farm PC/EQS (%)	Combined PC/EQS (%)	Combined PEC/EQS (%)
Broadland, The Broads, Barnby Broad & Marshes (RAMSAR, SPA, SAC (& SSSI components)	0.7	**2.8**	0.0	**3.4**	**251**
Sotterley Park (SSSI)*	0.4	2.6	0.1	2.9	**159.2**
Titsal Wood, Shadingfield (SSSI)	0.1	0	0.1	0.1	**80.3**
Pakefield to Easton Bavents (SSSI)	0.0	0	0.1	0.1	**21.1**
Benacre to Easton Bavents (SPA, SAC (& SSSI components)	0.0	0	0.0	0.2	20.9

*Note Critical Loads for Sotterley Park SSSI are not given in APIS – assumed to equal background levels

5.5.28 Table 57 indicates that the in-combination impacts exceed the 1% threshold at the Broadland, The Broads (RAMSAR, SPA, SAC) and associated SSSI designations. Similarly the 1% threshold is exceeded at the Sotterley Park SSSI although it should be noted that the Copeland Way impact has been estimated at this location.

5.5.29 However, the proposed development impacts are shown to be insignificant in comparison to the potentially significant impacts of other developments. As stated previously it is Natural England's view that *"care should be taken to avoid unnecessarily combining the insignificant effects of the subject plan or project with the effects of other plans or projects which can be considered significant in their own right".* In such circumstances the HRA should focus on the potentially significant impacts individually.

5.5.30 In addition, the Proposed Development is based on permitted emission limits and actual emissions are likely to be lower than those assessed in this report.

5.5.31 As such the in-combination assessment does not indicate that the acid deposition impacts from the Proposed Development can be considered as significant.

Non atmospheric sources

5.5.32 The development site or in-combination developments provide no other pathways for nutrients to ecological designations.

6.0 Conclusions

6.1.1 Enzygo Limited was commissioned by V.C. Cooke Limited to undertake an Air Quality Assessment in support of the EP application for a Small Waste Incineration Plant (SWIP) to be located at Land at Ellough Road, Beccles, NR34 7TQ.

6.1.2 The proposed development would be located within an existing consented Materials Recycling Facility (MRF), however, as the building has no existing consent for thermal combustion. The combined heat and power will be utilised by units within the adjacent industrial estate, supporting its sustainable expansion as allocated by the Local Plan.

6.1.3 Dispersion modelling of pollutants arising from the combustion process to provide heat and power using emission limits stated in the Environmental Permitting Technical Guidance Note PG13/1(20). Impacts at human and ecological sensitive receptors were quantified and the results compared with the relevant EQSs, and significance criteria provided by the EA.

6.1.4 Impacts were based on the maximum predicted concentrations over 5 assessment years to provide a robust assessment. In addition, a roadside background NO_2 concentration was applied at receptors close to major roads to take account of elevated concentrations at these locations.

6.1.5 The relevant EQSs were not exceeded at any location within the assessment extents.

6.1.6 Predicted impacts on existing pollutant concentrations at human receptor locations following the EA screening criteria were deemed as not requiring further assessment for all pollutant species and averaging periods.

6.1.7 Cr PC impacts could not be immediately screened out based on maximum ELVs. However, following the EA guidance on assessing group 3 metal stack emissions, impacts were screened as insignificant.

6.1.8 At ecological designations, predicted impacts of the Proposed Development in isolations on nitrogen and acid gas concentrations and deposition rates could be screened out as insignificant in accordance with the EA screening criteria and are therefore not significant. The re-assessment of SO_2 concentrations against the more stringent critical level remained as not significant at all designations.

6.1.9 The in-combination ecological assessment showed that the screening threshold were exceeded by other developments alone and not as a direct result of the Proposed Development. In such circumstances the HRA should focus on the potentially significant impacts individually and the in-combination assessment does not indicate that impacts from the Proposed Development can be considered as significant.

6.1.10 The Proposed Development is based on permitted emission limits and actual emissions are likely to be lower than those assessed in this report.

6.1.11 Based on the predictions and the use of robust assumptions, it is considered that the overall air quality impacts of the proposed operation would be not significant.

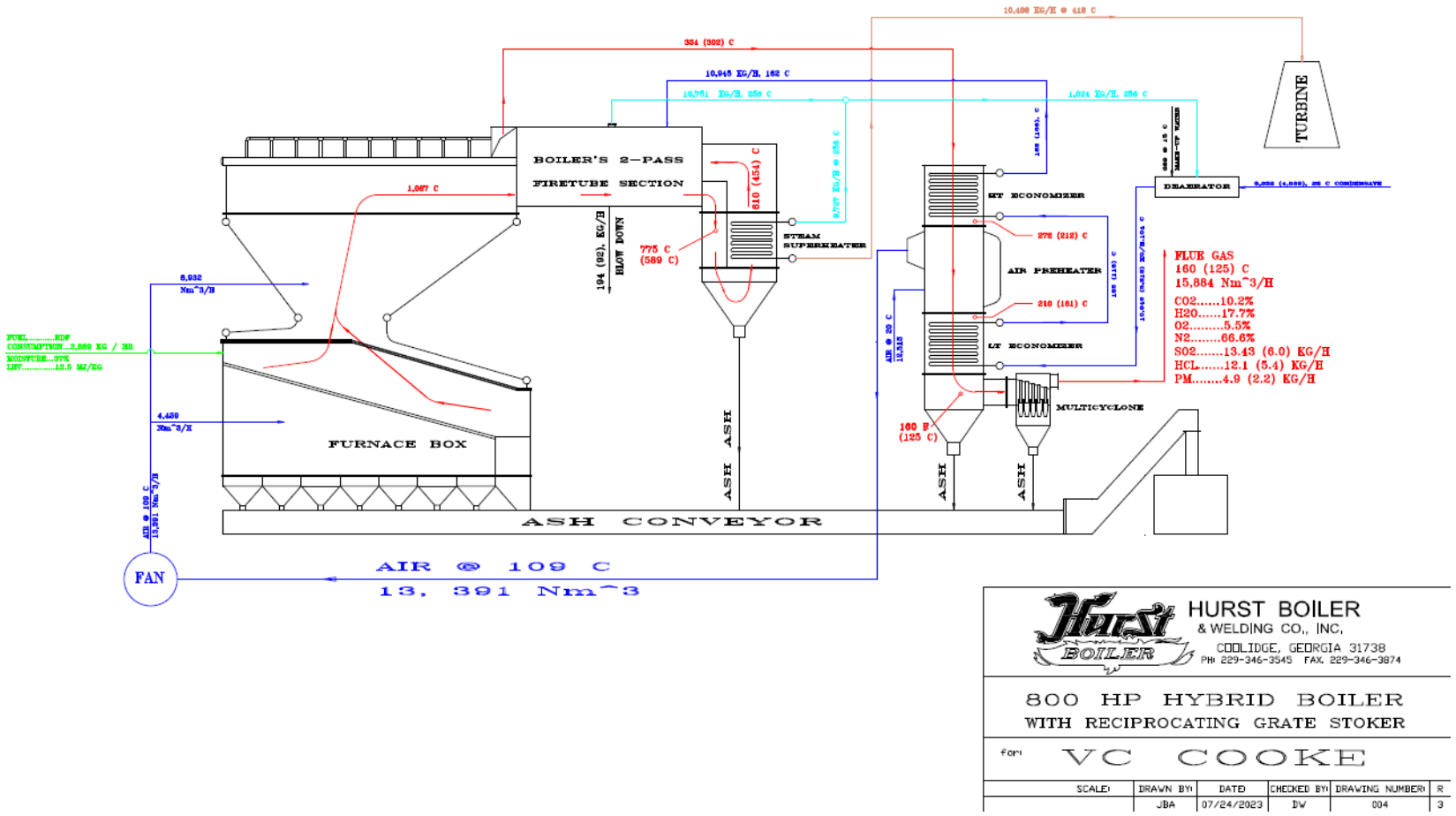
7.0 Abbreviations

%ile	Percentile
ADM	Atmospheric Dispersion Modelling
APIS	Atmospheric Pollution Information System
AQA	Air Quality Assessment
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
As	Arsenic
AURN	Automatic Urban and Rural Network
BAT	Best Available Techniques
C_6H_6	Benzene
Cd	Cadmium
CERC	Cambridge Environmental Research Consultants
CHP	Combined Heat and Power
CO	Carbon Monoxide
Co	Cobalt
Cr	Chromium
Cu	Copper
CWS	County Wildlife Site
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ELV	Emission Limit Values
EQS	Environmental Quality Standard
ESC	East Suffolk Council
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
Hg	Mercury
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
Mn	Manganese
N	Nitrogen
NGR	National Grid Reference
NH_3	Ammonia
Ni	Nickel
NNR	National Nature Reserve
Pb	Lead
PC	Process Contribution
PCDD/Fs	Dioxins and Furans
PEC	Predicted Environmental Concentration
PM	Particulate Matter
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 µm
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 µm
SAC	Special Area of Conservation
Sb	Antimony
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SWIP	Small Waste Incineration Plant

Ti	Thallium
TOC	Total Organic Compounds
TOMPs	Toxic Organic Micro-Pollutants
UKEAP	UK Eutrophying and Acidifying Pollutants
V	Vanadium
VOC	Volatile Organic Compounds
z_0	Roughness Length

Appendix A – Boiler Flow Chart

VC COOKE RDF FIRED 800 BHP BOILER FLOW CHART AT 100% LOAD



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