Air Quality Assessment

Energy Ventures No1 Ltd

Selby Energy Recovery Plant

14th August 2025

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Air Quality Assessment

Selby Energy Recovery Plant

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Acronyms and Abbreviations

Name	Description
ADMS	Atmospheric Dispersion Modelling System
AEL	Associated Emission Limit
AMCT	Annual Mean Concentration Target
APIS	Air Pollution Information System
AQAL	Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
As	Arsenic
ATT	Advanced Thermal Treatment
BaP	Benzo(a)pyrene
BAT	Best Available Technology
BDC	Broadland District Council
BREF	BAT Reference

Cd	Cadmium
Co	Cobalt
CO	Carbon Monoxide
Cu	Copper
CrIII	Trivalent Chromium
CrVI	Hexavalent Chromium
Defra	Department for Environment, Food and Rural Affairs
EAL	Environmental Assessment Level
ELV	Emission Limit Value
EPR	Environmental Permitting Regulations
EU	European Union
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
Hg	Mercury
IAQM	Institute of Air Quality Management
IED	Industrial Emissions Directive
LAQM	Local Air Quality Management
LCPD	Large Combustion Plant Directive
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MCPD	Medium Combustion Plant Directive
Mn	Manganese
NAEI	National Atmospheric Emissions Inventory
NH_3	Ammonia
Ni	Nickel
NNDC	North Norfolk District Council
NNR	National Nature Reserve
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PC	Process Contribution

PCB	Polychlorinated Biphenyl
PEC	Predicted Environmental Concentration
PERT	Population Exposure Reduction Target
PM_{10}	Particulate Matter <10 µm
$PM_{2.5}$	Particulate Matter <2.5 µm
RDF	Refuse Derived Fuels
SAC	Special Area of Conservation
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SRF	Solid Recovered Fuels
SSSI	Site of Special Scientific Interest
SWIP	Small Waste Incineration Plant
Tl	Thallium
TOC	Total Organic Carbon
TOMPS	Toxic Organic Micropollutants
UK-AIR	UK Air Information Resource
V	Vanadium
VOC	Volatile Organic Compound
WHO	World Health Organization
WID	Waste Incineration Directive

EXECUTIVE SUMMARY

Sol Environment Ltd has been commissioned by Energy Ventures No1 Ltd to undertake an assessment of the likely local air quality impacts arising from emissions to air from an energy recovery facility at Aviation Road, Sherburn in Elmet, Leeds, LS25 6NF. The purpose of the assessment is to support an Environmental Permit application for the facility.

The site lies within the former administrative area of Selby District Council (SDC) now part of North Yorkshire Council (NYC). SDC had declared one Air Quality Management Area (AQMA) for annual mean nitrogen dioxide (NO_2) within the town of Selby. This AQMA is located 10 km to the east of the EFW facility site and would not be affected by emissions from the facility.

Detailed dispersion modelling has been undertaken to determine the potential impacts arising from the proposed EFW facility. Emissions from the EFW facility would be regulated by the Industrial Emissions Directive (IED). Maximum predicted concentrations are compared with the relevant Air Quality Objectives (AQO) and Environmental Assessment Levels (EALs) for the protection of human health. The significance of the impacts has been assessed using criteria provided in the Environment Agency's Risk Assessment Guidance.

The maximum impact of pollutant emissions from the facility on local air quality is considered not significant on the basis of the Environment Agency's risk assessment criteria and professional judgement.

The impact of emissions from the facility on local habitat sites was also assessed and found to be not significant compared with existing background conditions and relevant critical levels and loads.

1. INTRODUCTION

Sol Environment Ltd has been commissioned by Energy Ventures No1 Ltd to undertake an assessment of the likely local air quality impacts arising from emissions to air from an energy recovery facility at Aviation Road, Sherburn in Elmet, Leeds, LS25 6NF. The purpose of the assessment is to support an Environmental Permit application for the facility.

The facility site is located in an area dominated by light industrial and commercial use to the east of Sherburn in Elmet and to the northwest of the Sherburn in Elmet Aerodrome. The site location is presented in **Figure 1.1.** There are isolated residential properties to the north and east of the site along Bishopdyke Road, the nearest being approximately 500 m from the site. The more densely populated areas of the town are located approximately 700 m to the west of the site.

There would be a single emission to air from the installation via a 50 m stack. Emissions from the facility will be governed by the Industrial Emissions Directive (IED)[1], which requires adherence to emission limits for the following pollutants:

- nitrogen oxides (NOx as NO_2);
- carbon monoxide;
- total dust (as PM_{10} and $PM_{2.5}$);
- gaseous and vaporous organic substances, expressed as total organic carbon;
- sulphur dioxide;
- hydrogen chloride;
- hydrogen fluoride;
- twelve trace metals; and
- dioxins and furans.

The assessment has also considered emissions of Polycyclic aromatic hydrocarbons (PAH, as Benzo[a]pyrene), polychlorinated biphenyls (PCBs) and ammonia (NH_3).

This report presents the findings of a dispersion modelling assessment to determine the impact of the installation on air quality at sensitive human and habitat receptors in the surrounding area.

1 The Industrial Emissions Directive, 2010/75/EU

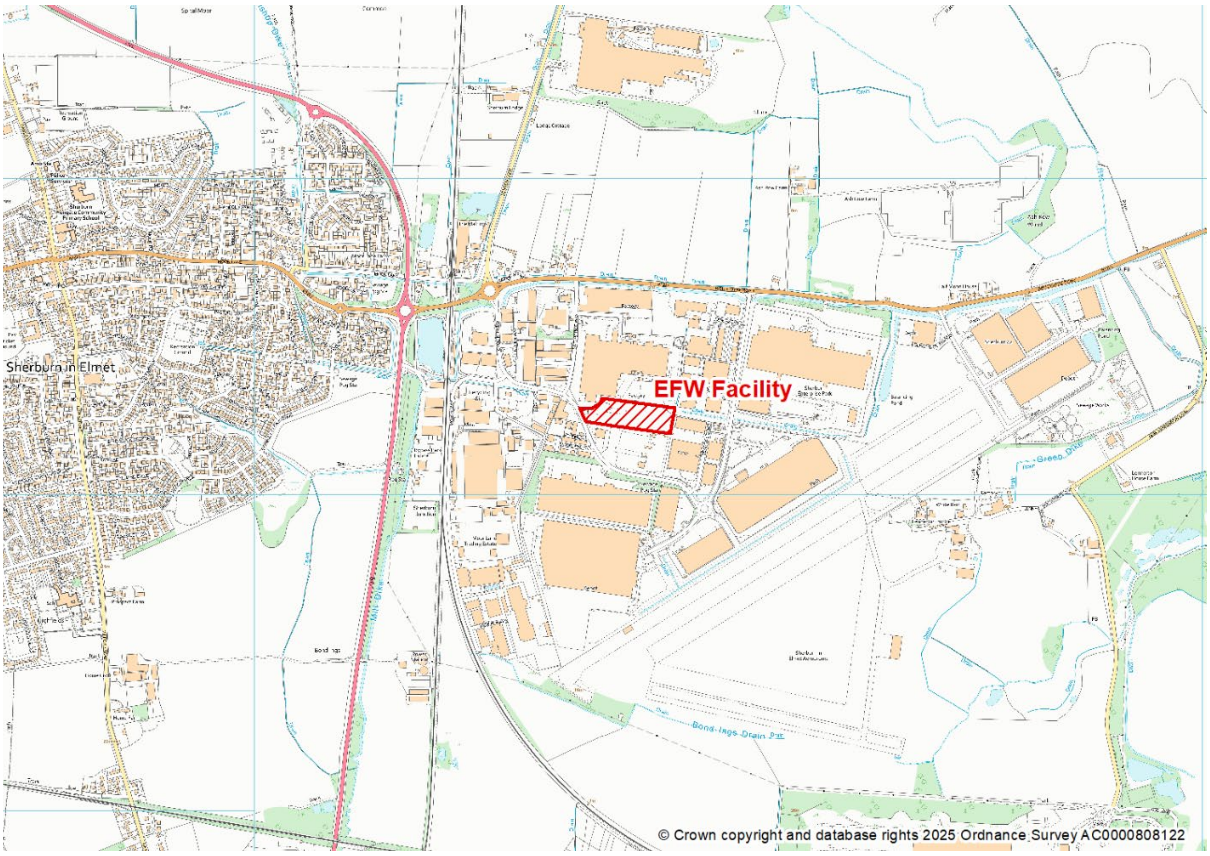


Figure 1.1: Site Location

2. LEGISLATION AND POLICY

2.1 The European Directive on Ambient Air and Cleaner Air for Europe

European Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, sets legally binding Europe-wide limit values for the protection of public health and sensitive habitats. The Directive streamlines the European Union's air quality legislation by replacing four of the five existing Air Quality Directives within a single, integrated instrument.

The pollutants included are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter of less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter of less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$), lead (Pb), carbon monoxide (CO), benzene, ozone (O_3), polycyclic aromatic hydrocarbons (PAHs), cadmium (Cd), arsenic (As), nickel (Ni) and mercury (Hg).

2.2 Environment Act 2021

The Environment Act 2021[2] establishes a legally binding duty on the government to bring forward new air quality targets by 31st October 2022 for $PM_{2.5}$.

The proposed air quality targets currently under consultation (consultation closed on 27th June 2022) are:

- An Annual Mean Concentration Target - a maximum concentration of 10 µg/m^3 to be met across England by 2040; and
- A Population Exposure Reduction Target ('exposure target') - a 35% reduction in population exposure by 2040 (compared to a base year of 2018).

These have been adopted into the first revision of Defra's Environmental Improvement Plant 2023 for England published in February 2023.

Schedule 11 of the Environment Act 2021 also strengthens the Local Air Quality Management (LAQM) framework which was introduced by the Environment Act 1995. Schedule 11 requires the LAQM framework to be reviewed and where appropriate modified within 12 months of the Environment Act coming into force and every 5 years following the initial review. Schedule 11 also places a duty on the local authority to have regard to the LAQM framework when exercising a function which could affect air quality (i.e. determining a planning application with air quality implications).

2.3 Air Quality Strategy 2023

The Air Quality Strategy[3] is the government's strategic framework for local authorities and other partners. It sets out their powers, responsibilities, and further actions the government expects them to take. It sets out a framework to enable local authorities to deliver for their communities and contribute to the government's long-term air quality goals, including ambitious new targets for fine particulate matter ($PM_{2.5}$).

It fulfils the statutory requirement of the Environment Act 1995 as amended by the Environment Act 2021 to publish an Air Quality Strategy setting out air quality standards, objectives, and measures for improving ambient air quality every 5 years. It does not replicate or replace other air quality guidance documents relevant to local authorities.

2 Environment Act 2021, 2021 Chapter 30

3 Air Quality Strategy, Framework for Local Authority Delivery, Department for Environment, Food and Rural Affairs (2023)

The government's national-level air quality regulations for concentrations consist of the Air Quality Standards Regulations 2010, which set limits for several pollutants, including nitrogen oxides, particulate matter, and others. In addition, under the Environment Act 2021, the government has set two new legally-binding long-term targets to reduce concentrations of fine particulate matter, $PM_{2.5}$.

The two new targets are an annual mean concentration of 10 µg/m^3 and a reduction in average population exposure by 35% by 2040, compared to a 2018 baseline. These targets are designed to help drive reductions in the worst $PM_{2.5}$ hotspots across the country, whilst ensuring nationwide action to improve air quality for everyone.

There are also an interim targets for each long-term target in the Environmental Improvement Plan which will promote early action and improvement. These are an annual mean $PM_{2.5}$ concentration of 12 µg/m^3 by January 2028 and a 22% reduction in average population exposure by January 2028 compared to a 2018 baseline.

2.4 Air Quality (England) Regulations

Many of the objectives in the Air Quality Strategy were made statutory in England with the *Air Quality (England) Regulations 2000* [4] and the *Air Quality (England) (Amendment) Regulations 2002* [5] (the Regulations) for the purpose of Local Air Quality Management (LAQM).

The Air Quality Standards (England) Regulations 2010[6] have adopted into UK law the limit values required by EU Directive 2008/50/EC[7] and came into force on the 10th June 2010. These regulations prescribe the 'relevant period' (referred to in Part I2V of the Environment Act 1995) that local authorities must consider in their review of the future quality of air within their area. The regulations also set out the air quality objectives to be achieved by the end of the 'relevant period'.

Ozone is not included in the Regulations as, due to its transboundary nature, mitigation measures must be implemented at a national level rather than at a local authority level.

The environmental assessment levels (EALs), air quality objectives (AQOs) for the pollutants considered in the assessment are presented in **Appendix A.**

2.5 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023

The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023[8] sets two legally binding environmental targets for air quality relating to the reduction of levels of fine particulate matter ($PM_{2.5}$) in ambient air: one with the purpose of reducing $PM_{2.5}$ in locations where concentrations are highest, the annual mean concentration target ("AMCT"); and a second with the purpose of reducing average exposure across the country, the population exposure reduction target ("PERT"). This instrument establishes for each target the level to be achieved and the date for its achievement, as well as making provision about monitoring, measurement, and calculation to assess whether the targets are met.

4 The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928

5 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043

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

7 Directive 2008/50/EC of the European Parliament and of the Council of 21st May 2008, on ambient air quality and cleaner air for Europe

8 The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 - Statutory Instrument 2023 No. 96

This instrument satisfies the requirement in section 1(2) of the Environment Act 2021 ("the Environment Act") for government to set at least one target in the priority area of air quality and section 2 of the Environment Act to set a target in respect of the annual mean level of $PM_{2.5}$ in ambient air.

2.6 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995 also requires local authorities to periodically review and assess the quality of air within their administrative area. The Reviews have to consider the present and future air quality and whether any air quality objectives prescribed in Regulations are being achieved or are likely to be achieved in the future.

Where any of the prescribed air quality objectives are not likely to be achieved the authority concerned must designate that part an Air Quality Management Area (AQMA).

For each AQMA, the local authority has a duty to draw up an Air Quality Action Plan (AQAP) setting out the measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the air quality objectives. Local authorities are not statutorily obliged to meet the objectives, but they must show that they are working towards them.

The Department of Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their Review and Assessment work[9]. This guidance, referred to in this chapter as LAQM.TG(22), has been used where appropriate in the assessment.

2.7 Industrial Emissions Directive

The Industrial Emissions Directive (2010/75/EU) came into force on the 6th January 2011, replacing the seven existing Directives, including the Waste Incineration Directive (WID) and Large Combustion Plant Directive (LDPD), implemented through the Environmental Permitting Regulations (EPR).

The aim of the Directive is to simplify the existing legislation and reduce administrative costs, whilst maintaining a high level of protection for the environment and human health. Permits will still be issued under EPR. However, existing and new sites will be required to comply with the requirements of the IED, which places greater emphasis on new plant best available technology (BAT).

The IED has been transposed into UK law via the Environmental Permitting (England and Wales) (Amendment) Regulations 2013 (SI 2013 No, 390), which came into force on 27 February 2013.

The design and operation of all new waste incinerations facilities must ensure compliance with emission limit values (ELVs) set out in the IED; these ELVs are summarised in **Table 2.1.**

9 Department for Environment, Food and Rural Affairs (DEFRA), (2022): Part IV The Environment Act 1995 Local Air Quality Management Review and Assessment Technical Guidance LAQM.TG(22)

Table 2.1: IED Emission Limits (mg/Nm³)

Pollutant	ELV (Referenced to 11% O_2)
Daily Average	
Total dust	10
Total organic carbon (TOC)	10
Hydrogen chloride (HCl)	10
Hydrogen fluoride (HF)	1
Sulphur dioxide (SO_2)	50
Oxides of nitrogen (NOx)	200
Carbon monoxide (CO)	50
Half-Hourly Average	
Total dust	30
Total organic carbon (TOC)	20
Hydrogen chloride (HCl)	60
Hydrogen fluoride (HF)	4
Sulphur dioxide (SO_2)	200
Oxides of nitrogen (NOx)	400
Carbon monoxide (CO)	100
Average over a sample period between 30-Minutes and 8-Hours	
Group 1 metals (a)	0.05
Group 2 metals (b)	0.05
Group 3 metals (c)	0.5
Average over a sample period between 6-Hours and 8-Hours	
Dioxins and furans (d)	1×10^{-7}

(a) Cadmium (Cd) and Thallium (Tl)
(b) Mercury (Hg)
(c) Antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V)
(d) I-TEQ

The European Union Best Available Techniques (BAT) Reference Document (BREF) for Waste Incineration was adopted in December 2019. The proposed facility does not currently have an Environmental Permit. Therefore, it will be classed as a new plant.

The BREF provides BAT Associated Emission Limits (AEL) for new plants and existing plants. For the purposes of this assessment, it is assumed that the plant will need to comply with the requirements for new plant. These ELVs are provided as a range of concentrations for each pollutant. Therefore, for the purposes of this assessment it is assumed that the plant will comply with the upper range of emissions as provided in Table 2.2.

Table 2.2: BAT Associated Emission Limits (mg/Nm^3)

Pollutant	Emission Limit (a)
Total Dust	5
Gaseous and vaporous organic substances, expressed as total organic carbon (TOC)	10
Sulphur Dioxide	30
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2	120
Carbon Monoxide	50
Hydrogen Chloride	6
Hydrogen Fluoride	1
Ammonia (NH_3)	10
Group I Metals (Cd, Tl)	0.02 (group total)
Group II Metals (Hg)	0.02
Group III Metals (Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V)	0.3 (group total)
Dioxins and furans (PCDD/Fs)	0.06×10^{-6}
(a) Dry gas at 273.15K, 101.3 kPa and 11% O2	

3. METHODOLOGY

3.1 Scope of the Assessment

The scope of the assessment has been determined in the following way:

- Review of air quality data for the area surrounding the site, including data from the Defra Air Quality Information Resource (UK-AIR);
- Desk study to confirm the location of nearby areas that may be sensitive to changes in local air quality; and
- Review and modelling of emissions data which has been used as an input to the UK Atmospheric Dispersion Modelling System (ADMS) dispersion model.

The assessment for the facility comprises a review of emission parameters for the installation and dispersion modelling to predict ground-level concentrations of pollutants at sensitive human and habitat receptor locations.

Predicted ground level concentrations are compared with relevant air quality standards for the protection of health and critical levels/ loads for the protection of sensitive ecosystems and vegetation.

3.2 Dispersion Model Parameters

The predicted impact of the facility emissions on local air quality has been undertaken using the UK ADMS dispersion model (Version 6.0).

Emissions (refer to **Table 2.2**) have been assumed based on the requirements of the BREF for new plant. For the purposes of the modelling assessment, the plant is assumed to be operating at full load, continually throughout the year, ensuring that a worst-case assessment of impacts is presented. Stack emission parameters (flow rate, temperature etc.) have been provided by the technology supplier.

For Group III trace metal predictions, it has been assumed in accordance with the Environment Agency's (EA) metals guidance[10], that each of the metals is emitted at the maximum ELV for the group (assumed to be 0.3 mg/Nm^3) as a worst case. The same approach has also been adopted for the Group I and II metals.

Where the screening criteria set out in the guidance are not met, typical emission concentrations for waste incineration plants have been used, as specified in the guidance. The plant will be equipped with air pollution control equipment specifically designed to control emissions from waste incineration facilities. Therefore, it is not unreasonable to assume that emissions from the facility will be no worse than the maximum measured at municipal waste incinerators.

An emission limit of 9 x 10^{-5} mg/Nm^3 has been assumed for PAH (benzo(a)pyrene) based on the Defra (WR0608) report on emissions from waste management facilities[11]. Information on PCB emissions has been obtained from the Waste Incineration BREF document which provides a range of PCB emissions from the incineration of municipal waste. This states that the annual average PCB emission is less than 0.005 mg/Nm^3. Therefore, the PCB emission is assumed to be 0.005 mg/Nm^3 in the absence of an ELV.

A summary of the input parameters used in the assessment are provided in **Appendix B**.

10 Releases from waste incinerators, Guidance on assessing group 3 metal stack emissions from incinerators – Version 4
11 WR 0608 Emissions from Waste Management Facilities, ERM Report on Behalf of Defra (July 2011)

3.2.1 Meteorological Data

Dispersion modelling has been undertaken using five years (2020-2024) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. The nearest meteorological station to the site is located at Bramham, approximately 9 km to the northwest. However, there is no cloud cover data for Bramham. The nearest station with good data capture is Leeds Bradford Airport (approximately 27 km west of the facility site) but this observing station has very predominant westerly wind directions which may not be representative of the site location. Therefore, a Numerical Weather Prediction (NWP) data set has been obtained specific to the site location. The NWP data are available across the entire UK at a 3 km by 3 km grid resolution. They are obtained using the widely accepted Weather Research and Forecasting (WRF) Model using data which includes measured observational information. Therefore, these data are site specific and will be characteristic of the site location and will provide results to an acceptable degree of reliability and precision. Wind roses for each year of meteorological data are presented in Appendix C.

3.2.2 Building Downwash / Entrainment

The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called building downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and results in higher ground level concentrations closer to the stack.

Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant. All potential downwash structures have been included in the model. Details of the buildings included in the model are provided in Table 3.1. In ADMS, building footprints can only be represented as a rectangle or circle. Therefore, the building dimensions in the model represent the building shape rather than actual measurements. For buildings with a pitched roof, the mean height is used for the building height.

Table 3.1: Building Downwash Structures

Building	Easting	Northing	Height (m)	Length (m)	Width (m)	Angle (°)
Kingspan upper	451095	433402	12.3	116	171	96.5
Kingspan lower	451231	433428	8.5	150	106	96.5
Waste Reception	451159	433259	16.1	25	30	96.5
Fuel Store	451192	433259	33.2	30	40	96.5
Steam Turbine	451226	433231	28.5	42	22	96.5
SEAB	451183	433233	25.6	40	15	96.5
ACC	451276	433224	21.0	33	31	96.5
Flue Gas Treatment	451269	433250	21.0	15	15	96.5
Tanks	451275	433267	13.3	15	12	96.5
Steam Generator	451227	433256	36.0	39	29	96.5
Fire Tank	451300	433221	13.0	Diameter = 12 m		

3.2.3 Topography

The presence of elevated terrain can significantly affect the dispersion of pollutants by increasing turbulence and reducing the distance between the plume centre line and the ground level.

A topographical data set has been included in the model to ensure that the impact of terrain features on the dispersion of emissions from the facility is taken into account.

3.2.4 Nitric Oxide to Nitrogen Dioxide Conversion

Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3).

A conversion ratio of 70% NOx:NO_2 has been assumed for the comparison of predicted concentrations with the long-term objectives for NO_2. A conversion ratio of 35% has been utilised for the assessment of short-term impacts, as recommended by the Environment Agency's Risk Assessment Guidance.

3.3 Sensitive Receptors

LAQM.TG(22) describes in detail typical locations where consideration should be given to pollutants defined in the Regulations. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standards (i.e. 15-minute mean or 1-hour mean) may be relevant. However, at a school or adjacent to a private dwelling where exposure may be for longer periods, comparison with long-term (such as 24-hour mean or annual mean) standards may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

The location of the discrete sensitive receptors selected for the assessment is presented in **Table 3.2**. and **Figure 3.1.**

Table 3.2: Human Health Receptors

Ref.	Receptor	Type	Easting	Northing
R1	Cafe	Leisure	450968	433368
R2	Fitness Studio	Leisure	450994	433215
R3	Lennerton Lodge	Residential	452100	432936
R4	Bishopdyke Road	Residential	452248	433619
R5	Low Hall Farm	Residential	453045	433465
R6	New Lennerton Lane	Residential	452867	433730
R7	Bishopdyke Road	Residential	451650	433678
R8	Bishopdyke Road	Residential	450971	433718

R9	Bishopdyke Road	Residential	450803	433713
R10	Moor Lane	Residential	450458	433717
R11	Saxon Court	Residential	450423	433514
R12	Saxon Mews	Residential	450415	433409
R13	Damson Drive	Residential	450227	433315
R14	Blenheim Garth	Residential	450072	433063
R15	Norden's Barn Farm	Residential	451253	431805
R16	Proposed housing (Local Plan)	Residential	450376	432869

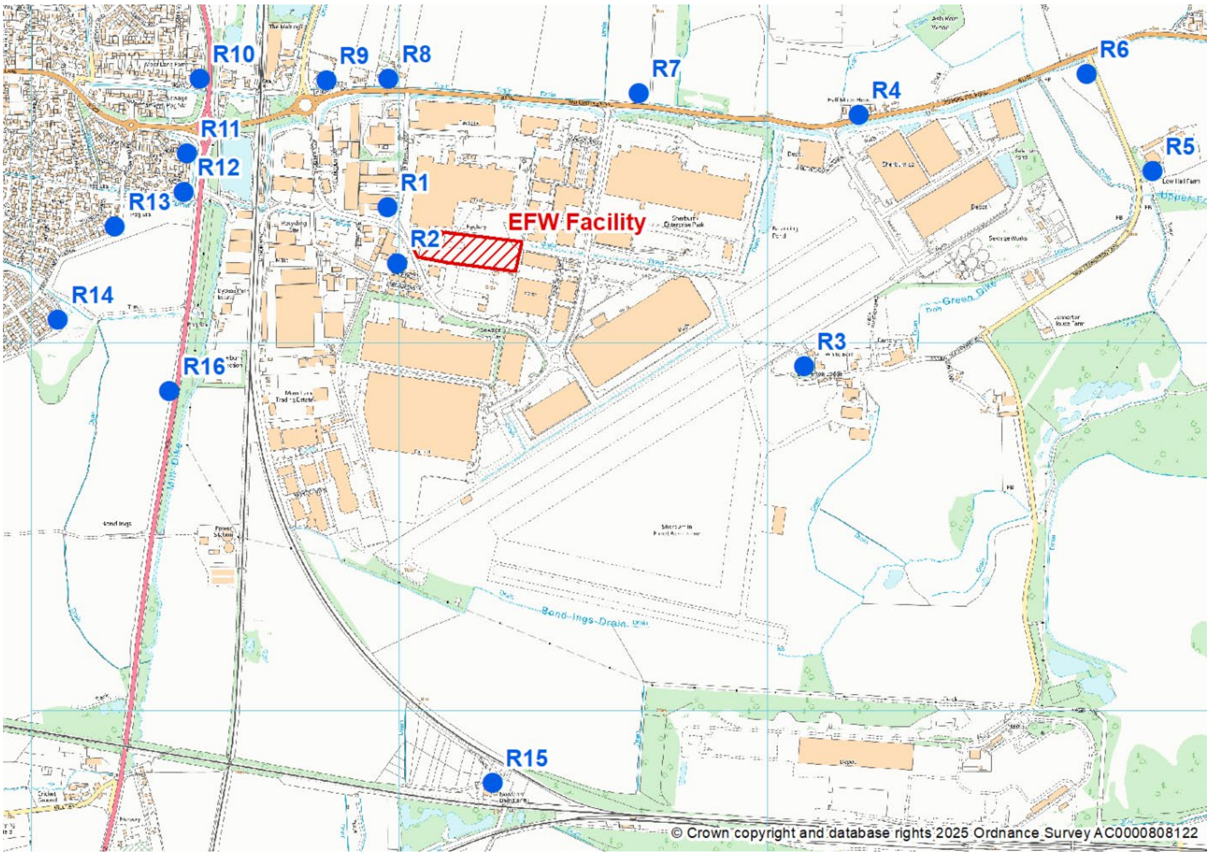


Figure 3.1: Sensitive Human Health Receptor Locations

Pollutant concentrations have been predicted at both discrete receptor locations and over a 4 km by 4 km Cartesian grid of 80 m resolution.

3.4 Habitat Assessment

The Environment Agency's risk assessment guidance [12] states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive;

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

- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive; and
- Ramsar Sites designated under the Convention on Wetlands of International Importance.

Within 2 km of the source:

- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- local wildlife sites (Sites of Interest for Nature Conservation, SINC and Sites of Local Interest for Nature Conservation, SLINC); and
- Ancient woodland.

Habitat receptor designations and locations relevant to the assessment are presented in **Table 3.3** and **Figure 3.2.** There are no European sites within 10 km and no SSSI's within 2 km. There are two LWS within 2 km of the facility site.

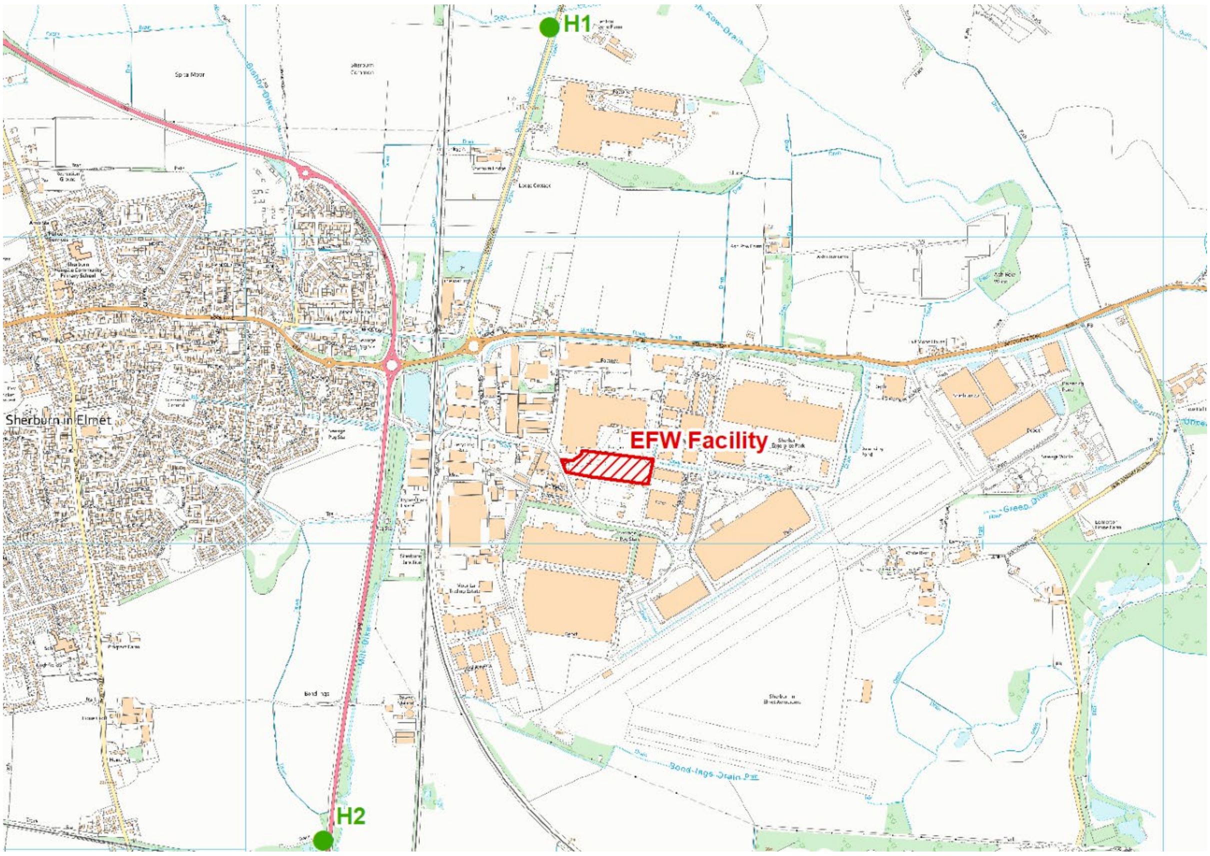


Figure 3.2: Sensitive Habitat Receptor Locations

Table 3.3: Sensitive Habitat Receptors

Receptor	Primary Habitat	Approx. Location (Relative to Site)
H1. Pasture Opposite Gypsum Works LWS	Grassland	1.4 km north
H2. Ash Tree Dike and Ponds LWS	Open water and woodland	1.6 km south southwest

The habitat sites have been represented in the model by discrete receptors at the boundary of the designated area closest to the facility site.

The modelled ground level pollutant concentrations are used to predict deposition rates, using typical deposition velocities. A summary of typical NO_2, SO_2, HCl and NH_3 dry deposition velocities is presented in **Table 3.4.**

Table 3.4: Dry Deposition Velocities (m/s)

Pollutant	Grassland	Woodland
Nitrogen Dioxide (NO_2)	0.0015	0.0030
Sulphur Dioxide (SO_2)	0.012	0.024
Ammonia (NH_3)	0.020	0.030
Hydrogen Chloride (HCl)	0.025	0.060

The predicted nitrogen deposition rates assume a 100% NOx: NO_2 conversion. This represents a worst-case for the assessment since nitric oxide (NO) has a lower deposition velocity than NO_2 and consequently results in lower deposition rates.

Predicted ground level concentrations and acidification/ deposition rates are compared with relevant air quality standards, critical levels and critical loads for the protection of sensitive ecosystems and vegetation (see **Appendix D**).

AQTAG06[13] states that the wet deposition of SO_2, NO_2 and NH_3 is 'not significant' within a short range. However, wet deposition of HCl should be considered where a process emits this pollutant. It is considered that within a few kilometres of the source, the wet deposition rate is comparable to the dry deposition rate and with increasing distance, the wet deposition fraction becomes a smaller fraction of the total HCl deposition. As a worst-case, the wet-to-dry deposition ratio is assumed to be 1:1 at all of the identified habitat sites. Therefore, the HCl wet deposition is equivalent to the HCl dry deposition rate (i.e. the total deposition of HCl is twice the dry deposition rate of HCl).

13 AQTAG06 – Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, Environment Agency (March 2014)

3.5 Significance Criteria

3.5.1 Impacts on Human Health

The Environment Agency has developed criteria for assessing the significance of an impact compared with relevant air quality standards and background air quality[14]. A process contribution (PC) is considered not significant if:

- the long-term PC < 1% of the long-term air quality standard; and/or
- the short-term PC < 10% of the short-term air quality standard.

At less than 1% of the long-term air quality standard, the impact of a development is unlikely to be significant compared with background air quality. Both the short- and long-term criteria are also designed to ensure that there is a substantial safety margin to protect public health and the environment.

If the screening criteria are not met the process contribution should be considered in combination with relevant ambient background pollutant concentrations. The air quality standards are likely to be met if:

- the long-term PC + background concentration < 70% of the air quality standard; and/or
- the short-term PC < 20% of the air quality standard minus the short-term background concentration, where the short-term background concentration is assumed to be twice the long-term background concentration.

For the Group III metals the significance of emissions is determined following the Environment Agency guidance on releases from waste Incinerators, which recommends a two-step approach to screening group III metal emissions, which is as follows:

- Step One – predict metal concentrations assuming each metal is being emitted at 100% of the group ELV. The results are compared against the following criteria:
  - Where the PC of any metal exceeds 1% of the long-term or 10% of the short-term air quality standard, then the PEC should be compared to the air quality standard.
  - Where the PEC exceeds 100% of the air quality standard, then the assessment should proceed to Step Two.
- Step Two – make predictions for the metals exceeding the criteria in Step One, using emission concentrations provided in the guidance. Where the PC of any metal exceeds 1% of the long-term or 10% of the short-term air quality standard, then the PEC should be compared to the air quality standard. Where the PEC exceeds 100% of the air quality standard, then the impact of the metal can be considered to be significant.

3.5.2 Impacts on Habitat Sites

The Environment Agency has developed criteria for assessing air quality impacts at SPAs, SACs, Ramsar sites and SSSIs, compared with the relevant critical level/load and background air quality. The criteria are designed to ensure that there is a substantial safety margin to protect the environment.

14 https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

3.5.2.1 Stage 1

A process contribution (PC) is considered not significant if:

- The long term PC < 1% of the long-term critical level/load
- The short term PC < 10% of the short-term critical level/load

3.5.2.2 Stage 2

If the Stage 1 screening criteria are not met, the PC should be considered in combination with relevant ambient background pollutant concentrations or deposition rates. The assessment criteria are likely to be met if:

- The long term PC + background concentration/deposition rate < 70% of the critical level/load
- The short term PC < 20% of the (critical level/load – short term background concentration or deposition rate)

3.5.2.3 Local Wildlife Sites

For local nature sites (SINCs, SLINC's, NNRs, LNRs and ancient woodland, a process contribution (PC) is considered not significant if:

- The long term PC < 100% of the long-term critical level/load
- The short term PC < 100% of the short-term critical level/load

4. BASELINE CONDITIONS

4.1 Local Authority Monitoring

North Yorkshire Council (NYC) does not undertake any automatic monitoring within their administrative area. Non-automatic monitoring of NO_2 was undertaken by NYC at 212 locations in 2023. Within the former Selby District Council area, there were 26 monitoring locations, but these are all located within the Selby at a distance of more than 10 km from the facility site. Therefore, measured concentrations at these locations would not be characteristic of air quality at the facility site.

4.2 Nitrogen Dioxide

As data are limited, annual mean NO_2 background concentrations for 2024 have been obtained from the Defra UK Background Air Pollution Maps[15]. The latest background maps (for NO_2, PM_{10} and $PM_{2.5}$) were issued in November 2024 and are based on 2021 monitoring data.

The highest 2024 mapped annual mean background concentration for the area surrounding the facility site is 9.9 $\mu g/m^3$, which includes a contribution from traffic on the primary routes through the area. This is the maximum for the nine 1 km^2 grids surrounding the site. Therefore, an annual mean background concentration of 9.9 $\mu g/m^3$ has been assumed based on the maximum mapped concentration.

4.3 Carbon Monoxide (CO)

Monitoring of background CO concentrations is not currently undertaken by NYC. Therefore, concentrations have been obtained from the Defra maps. The CO mapping is based on 2001 monitoring data and factors are available to project the concentrations to future years[16].

The 2024 maximum annual mean background CO concentration for the area surrounding the facility site is 135 $\mu g/m^3$.

4.4 Particulate Matter (PM_{10} and $PM_{2.5}$)

The 2024 maximum mapped background PM_{10} concentration for the area is 13.3 $\mu g/m^3$. This is the maximum for the nine 1 km^2 grids around the facility site.

Similarly, background $PM_{2.5}$ concentrations have been obtained from the Defra mapped concentrations and are assumed to be representative of background concentrations at the facility site. The maximum 2024 annual mean $PM_{2.5}$ concentration for the area around the facility is 6.4 $\mu g/m^3$, which is 32% of the EU target value of 20 $\mu g/m^3$.

4.5 Sulphur Dioxide (SO_2)

Automatic monitoring of SO_2 concentrations is not currently undertaken by NYC. The maximum mapped SO_2 concentration for the area surrounding the facility site is 7.5 $\mu g/m^3$. The SO_2 mapping is based on 2001 monitoring data and the 2024 SO_2 concentrations are assumed to be 100% of the published 2001 estimates and represent a worst-case.

15 https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018

16 http://laqm.defra.gov.uk/tools-monitoring-data/year-adjustment.html

4.6 Total Organic Carbon (as Benzene)

NYC does not undertake ambient monitoring of benzene or other total organic carbon compounds. Therefore, concentrations have been obtained from the Defra UK Background Air Pollution Maps. The mapped benzene concentrations are based on 2001 monitoring data, projected to 2010. This is the most recent projection available and is assumed to be representative of concentrations in future years.

The maximum estimated 2010 annual mean background benzene concentration for the area surrounding the facility site is 0.30 $\mu g/m^3$.

4.7 Hydrogen Chloride

Ambient monitoring of hydrogen chloride (HCl) is carried out as part of the Defra Acid Gases and Aerosols Network (AGANET) at a number of, predominantly rural, locations around the UK. The nearest monitoring site is located at Ladybower (rural background site), 55 km to the southwest of the facility site. However, monitoring of HCl ceased in 2016. For 2015, the monthly mean concentrations of HCl varied between 0.06 and 1.0 $\mu g/m^3$ and it is assumed as a worst-case that the maximum monthly concentration of 1.0 $\mu g/m^3$ is representative of the annual mean background concentration at the facility site and nearby sensitive receptors.

4.8 Hydrogen Fluoride (HF)

It is difficult to identify an appropriate background HF concentration as HF is not routinely measured in the UK, even historically. Furthermore, any measurements that have been made have been obtained from heavily industrialised locations.

Measurements obtained in the UK between 1984 and 1986 in the Marston Vale region of Bedfordshire[17] where there was a high density of brickworks, a known source of HF, revealed monthly mean concentrations of 0.040 to 0.86 $\mu g/m^3$. Daily mean concentrations of up to 2.2 $\mu g/m^3$ were also measured. These concentrations would not be characteristic of measured concentrations around the facility as concentrations measured forty years ago would not reflect present day regulatory controls. Data provided by the UK National Atmospheric Emissions Inventory (NAEI) indicates that emissions of HF have reduced from around 8 kilotonnes per annum (kt/a) in 1993 to less than 1 kt/a in 2021 mainly due to the decommissioning of coal fired power stations.

Information provided by the World Health Organization (WHO) in 2002[18] indicated that in areas not in the direct vicinity of emission sources, the mean concentrations of fluoride in ambient air would be generally less than 0.1 $\mu g/m^3$. Therefore, given the reduction in emissions since this time it is concluded that a concentration of 0.1 $\mu g/m^3$ as an annual mean would be representative of the worst-case for the facility site.

4.9 Ammonia (NH_3)

The Air Pollution Information System (APIS) provides mapped background ammonia concentrations principally for the assessment of airborne impacts of ammonia on habitat sites. This indicates that background ammonia concentrations in the vicinity of the facility site and surroundings are around 1.7 $\mu g/m^3$.

17 EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects.

18 Fluorides, Environmental Health Criteria 227, World Health Organization (2002)

4.10 Trace Metals

Defra has undertaken monitoring of trace elements at a number of locations in the UK since 1976 as part of the UK Urban and Rural Heavy Metals Monitoring Networks. Monitoring at a site in Sheffield Tinsley is the nearest background location to the facility site. However, this is an urban background site close to Sheffield and measured concentrations are likely to be higher than experienced around the facility site which is more rural. A summary of monitored concentrations for 2021 to 2023 is provided in **Table 4.1.**

Table 4.1: Annual Average UK Trace Metal Concentrations (ng/m³) – Sheffield Tinsley

Pollutant	2021	2022	2023	AQAL
Antimony (Sb)		Not measured		5,000-
Arsenic (As)	0.97	0.89	0.80	6
Cadmium (Cd)	0.35	0.26	0.29	5
Chromium (Cr)	32.3	32.5	34.4	-
Cobalt (Co)	0.64	1.4	0.85	1,000
Copper (Cu)	15.9	17.5	14.7	-
Lead (Pb)	14.1	11.7	12.3	250
Manganese (Mn)	34.2	34.4	32.0	150
Mercury (Hg) – London Westminster		2.7 (maximum for 2015 to 2018)		-
Nickel (Ni)	13.5	17.2	18.8	20
Thallium (Tl)		Not measured		1,000
Vanadium (V)	1.2	1.3	1.1	-

There are no measurements of antimony, mercury or thallium. There have been some historical measurements of gaseous mercury at a couple of monitoring locations up to 2018 when monitoring appears to have ceased. Measured concentrations of gaseous mercury were measured at the London Westminster site and the Runcorn Weston Point site between 2015 and 2018. Neither of these sites are characteristic of the facility location as London is heavily trafficked and Runcorn Weston Point is heavily industrial. Maxima annual mean concentrations at these two sites for the four years were 2.7 ng/m^3 and 20.1 ng/m^3 for the London Westminster and Runcorn Weston Point site, respectively. For the purposes of the assessment, it is assumed that measured concentrations at London Westminster (2.7 ng/m^3) are more characteristic of the site and surroundings but are likely to overestimate concentrations given the more rural nature of the facility site.

Except for nickel, all the measured concentrations are well below their respective air quality assessment level (AQAL) where monitoring is carried out. Nickel concentrations are quite high relative to the AQAL of 20 ng/m^3 (up to 94%) but are likely to be overestimated given the urban nature of the monitoring location. Guidance issued by the Environment Agency[10] for the assessment of Group 3 metals, states that for screening purposes it should be assumed that Cr(VI) comprises 20% of the total background chromium concentration. On this basis the annual average Cr(VI) concentration (up to 6.9 ng/m^3) substantially exceeds the AQAL of 0.25 ng/m^3. For the purposes of the assessment the minimum concentration measured over the three-year period has been adopted as a background concentration for the site and surrounding location but is considered to be an overestimate given the more rural nature of the facility site relative to the monitoring location.

4.11 Dioxins and Furans

Monitoring of PCDD/Fs is currently carried out by Defra at six locations in the UK (Hazelrigg, High Muffles, London, Manchester, Auchencorth Moss and Weybourne) as part of the Toxic Organic Micropollutants (TOMPs) Network.

To provide an indication of the range of PCDD/F concentrations that occur in the UK, a summary of the annual mean concentrations measured between 2014 and 2016 is presented in **Table 4.2.**

Table 4.2: UK PCDD/Fs Concentrations (fg TEQ/m³)

Monitoring Site	Type	2014	2015	2016
London	Urban background	2.9	4.4	21
Manchester	Urban background	17.0	6.0	12
Auchencorth Moss	Rural background	0.01	0.01	0.15
High Muffles	Rural background	1.1	0.5	2.8
Hazelrigg	Rural background	2.6	5.3	4.6
Weybourne	Rural background	1.6	1.4	18 (b)

In general, the concentration of dioxins and furans at rural locations is considerably lower than at urban locations. The mean for urban background locations for the three years is 10.6 fg TEQ/m^3. Whereas for the rural background sites the mean is 3.2 fg TEQ/m^3.

Therefore, the average concentration measured at the four rural background monitoring sites from 2014 to 2016 (3.2 fg TEQ/m^3) is assumed to be reasonably representative of the baseline dioxin and furan concentration at the facility site and nearby sensitive receptors.

4.12 Polycyclic Aromatic Hydrocarbons (as benzo[a]pyrene)

Monitoring of benzo(a)pyrene (BaP) is currently carried out by Defra at a number of locations in the UK as part of the TOMPS and PAH monitoring and analysis network. The nearest monitoring site is located in Leeds and is an urban background site. Measured concentrations of BaP varied between 0.18 and 0.21 ng/m^3 between 2021 and 2023. As an urban background site, concentrations are likely to be higher than at the facility site and it is assumed that the minimum annual mean for this site (0.18 ng/m^3) is a reasonable estimate of the background concentration in the vicinity of the facility site.

4.13 Polychlorinated Biphenyls

Monitoring of PCBs is currently carried out by Defra at six locations in the UK as part of the TOMPs Network. The average PCB concentration measured at the urban background monitoring sites (London and Manchester) from 2013 to 2015 is 106 pg/m^3 and for the rural background sites (Auchencorth Moss, High Muffles, Hazelrigg and Weybourne) 24 pg/m^3. Given the more rural nature of the facility site, the average rural background concentration is assumed to be reasonably representative of the baseline PCB concentration at the facility site and nearby sensitive receptors.

4.14 Summary of Background Concentrations

A summary of the annual mean and short-term background concentrations assumed for the assessment is presented in **Table 4.3.** The current background concentrations are assumed to be representative of future year concentrations. Since pollutant concentrations are expected to decline in the future, this ensures that the worst-case impacts are determined (i.e. future impacts combined with existing air quality).

Table 4.3: Summary of Background Concentrations

Pollutant	Annual Mean	Short-Term	
		Concentration	Averaging Period
Particles (PM_{10})	13.3 µg/m³	15.7 µg/m³ (a)(b)	24-hour
Particles ($PM_{2.5}$)	6.4 µg/m³	n/a	n/a
Nitrogen Dioxide (NO_2)	9.9 µg/m³	19.8 µg/m³ (a)	1-hour
Sulphur Dioxide (SO_2)	7.5 µg/m³	8.9 µg/ m³ (a)(b) 15.0 µg/m³ (a) 20.1 µg/m³ (a)(d)	24-hour 1-hour 15-minute
Carbon Monoxide (CO)	135 µg/m³	189 µg/m³ (a)(c) 270 µg/m³ (a)	8-hour 1-hour
Hydrogen Fluoride (HF)	0.1 µg/m³	0.2 µg/m³ (a) 0.2 µg/m³ (e)	1-hour Monthly/weekly
Hydrogen Chloride (HCl)	1.0 µg/m³	2.0 µg/m³ (a)	1-hour
TOC (Benzene)	0.30 µg/m³	0.35 µg/m³ (a)(b)	24-hour
Dioxins and Furans (PCDD/Fs)	3.2 fg/m³	n/a	n/a
Antimony (Sb)	No data available	n/a	n/a
Arsenic (As)	0.80 ng/m³	n/a	n/a
Cadmium (Cd)	0.26 ng/m³	0.31 ng/m³ (a)(b)	24-hour
Chromium (Cr)	32.3 ng/m³	38.1 ng/m³ (a)(b)	24-hour
Cobalt (Co)	0.64 ng/m³	n/a	n/a
Copper (Cu)	14.7 ng/m³	17.3 ng/m³ (a)(b)	24-hour
Lead (Pb)	11.7 ng/m³	n/a	n/a
Manganese (Mn)	32.0 ng/m³	64.0 ng/m³ (a)	1-hour
Mercury (Hg)	2.7 ng/m³	3.2 ng/m³ (a)(b) 5.4 ng/m³ (a)	24-hour 1-hour
Nickel (Ni)	13.5 ng/m³	27.0 ng/m³ (a)	1-hour
Thallium (Tl)	No data available	n/a	n/a
Vanadium (V)	1.1 ng/m³	1.3 ng/m³ (a)(b)	24-hour
Polycyclic Aromatic Hydrocarbons (as BaP)	0.18 ng/m³	n/a	n/a
Polychlorinated biphenyls (PCBs)	0.024 ng/m³	0.048 ng/m³ (a)	1-hour
Ammonia (NH_3)	1.7 µg/m³	3.4 µg/m³ (a)	1-hour

(a) 1-hour mean background concentration estimated by multiplying the annual mean by a factor of 2 in accordance with the EA Guidance

(b)	24-hour mean background concentration estimated by multiplying the 1-hour mean by a factor of 0.59 in accordance with the EA Guidance
(c)	8-hour mean background concentration estimated by multiplying the 1-hour mean by a factor of 0.70 in accordance with the EA Guidance
(d)	15-minute mean background concentration estimated by multiplying the 1-hour mean by a factor of 1.34 in accordance with the EA Guidance
(e)	In the absence of correction factors for this averaging period.

5. ASSESSMENT OF IMPACTS

5.1 Human Health Impact

5.1.1 Introduction

Predicted process contributions (PC) for the five years of meteorological data are presented as the maximum arising off-site and at each of the discrete receptors identified in **Table 3.1.**

The maximum PC is compared with the relevant air quality assessment level (AQAL, which include air quality objectives, air quality limits and environmental assessment levels) to determine the significance of the impact, in accordance with the Environment Agency's Risk Assessment Guidance. Where a potentially significant impact is identified, the total predicted environmental concentration (process contribution plus background) is compared with the AQAL to assess the likelihood of an exceedance.

5.1.2 Nitrogen Dioxide

The predicted annual mean and 99.8th percentile of 1-hour mean ground level NO_2 process contributions (PC) are presented in **Table 5.1**. The annual mean and 99.8th percentile of hourly mean NO_2 concentrations for 2023 are presented as a contour plot in **Figure 5.1** and **Figure 5.2**, respectively.

Table 5.1: Predicted NO_2 Concentrations (µg/m^3)

Receptor	Annual Mean		99.8th Percentile of 1-Hour Means	
	PC (µg/m^3)	PC (% AQAL)	PC (µg/m^3)	PC (% AQAL)
Maximum Off-Site	2.4	5.9%	18.8	9.4%
R1 Cafe	0.29	0.7%	7.0	3.5%
R2 Fitness Studio	0.24	0.6%	8.0	4.0%
R3 Lennerton Lodge	0.62	1.6%	4.1	2.1%
R4 Bishopdyke Road	0.47	1.2%	4.1	2.0%
R5 Low Hall Farm	0.27	0.7%	2.3	1.2%
R6New Lennerton Lane	0.27	0.7%	2.4	1.2%
R7 Bishopdyke Road	0.60	1.5%	5.2	2.6%
R8 Bishopdyke Road	0.15	0.4%	4.1	2.1%
R9 Bishopdyke Road	0.17	0.4%	3.8	1.9%
R10 Moor Lane	0.19	0.5%	3.6	1.8%
R11 Saxon Court	0.23	0.6%	3.8	1.9%
R12 Saxon Mews	0.26	0.7%	3.8	1.9%
R13 Damson Drive	0.22	0.5%	3.2	1.6%
R14 Blenheim Garth	0.15	0.4%	2.9	1.4%
R15 Norden's Barn Farm	0.14	0.3%	1.9	1.0%
R16 Proposed housing (Local Plan)	0.16	0.4%	3.7	1.9%
AQAL (µg/m^3)	40		200	
Background (µg/m^3)	9.9		19.8	

Maximum PEC	12.3	38.6
Maximum PEC (% AQAL)	30.6%	19.3%

At some receptor locations, the predicted annual mean concentration is 1% or more of the AQAL and would be assessed as potentially significant. However, including the background concentration of 9.9 µg/m^3, the predicted maximum off-site annual mean concentration (PEC) is 30.6% of the air quality objective of 40 µg/m^3. Therefore, it is concluded that the AQAL would be met. The maximum impact occurs to the immediate east of the facility over the industrial estate.

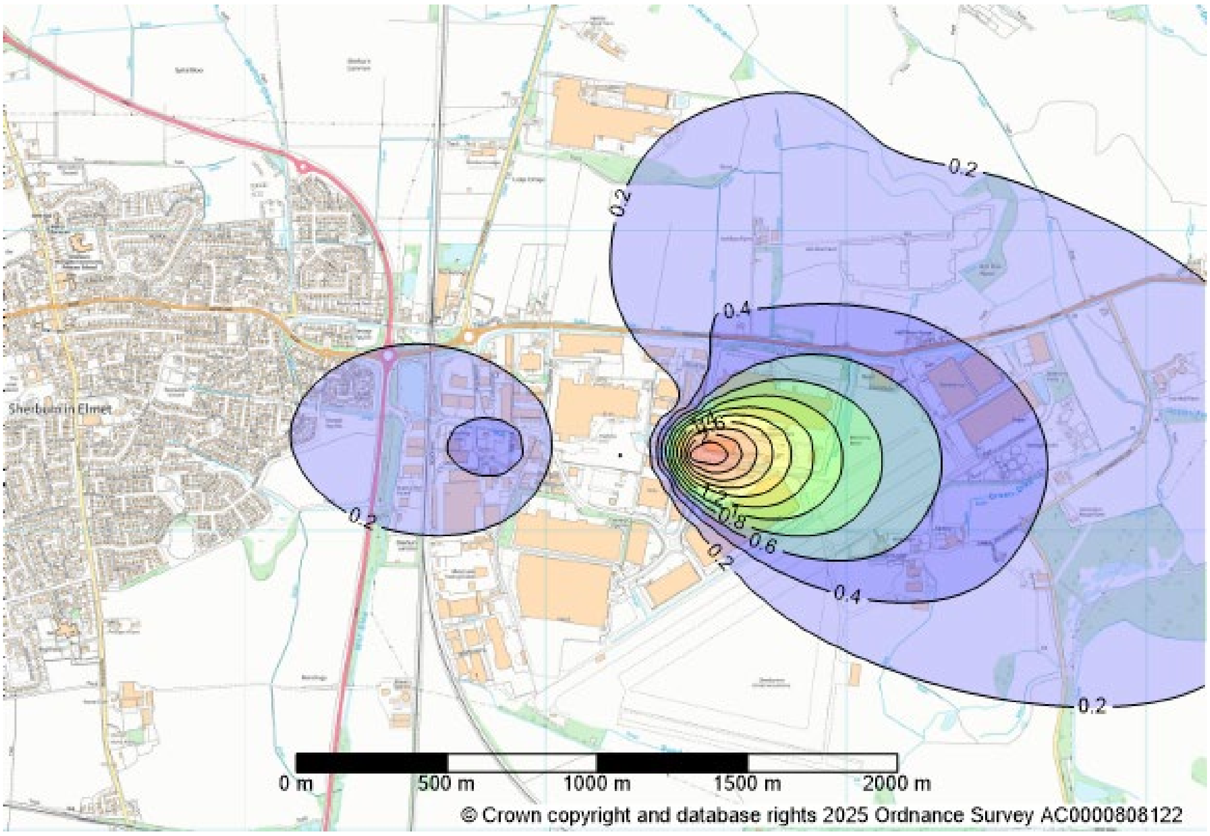


Figure 5.1: Predicted Annual Mean NO_2 Concentrations for 2023 (µg/m^3)

The maximum predicted short-term concentrations are less than 10% of the hourly mean air quality objective and would be assessed as not significant.

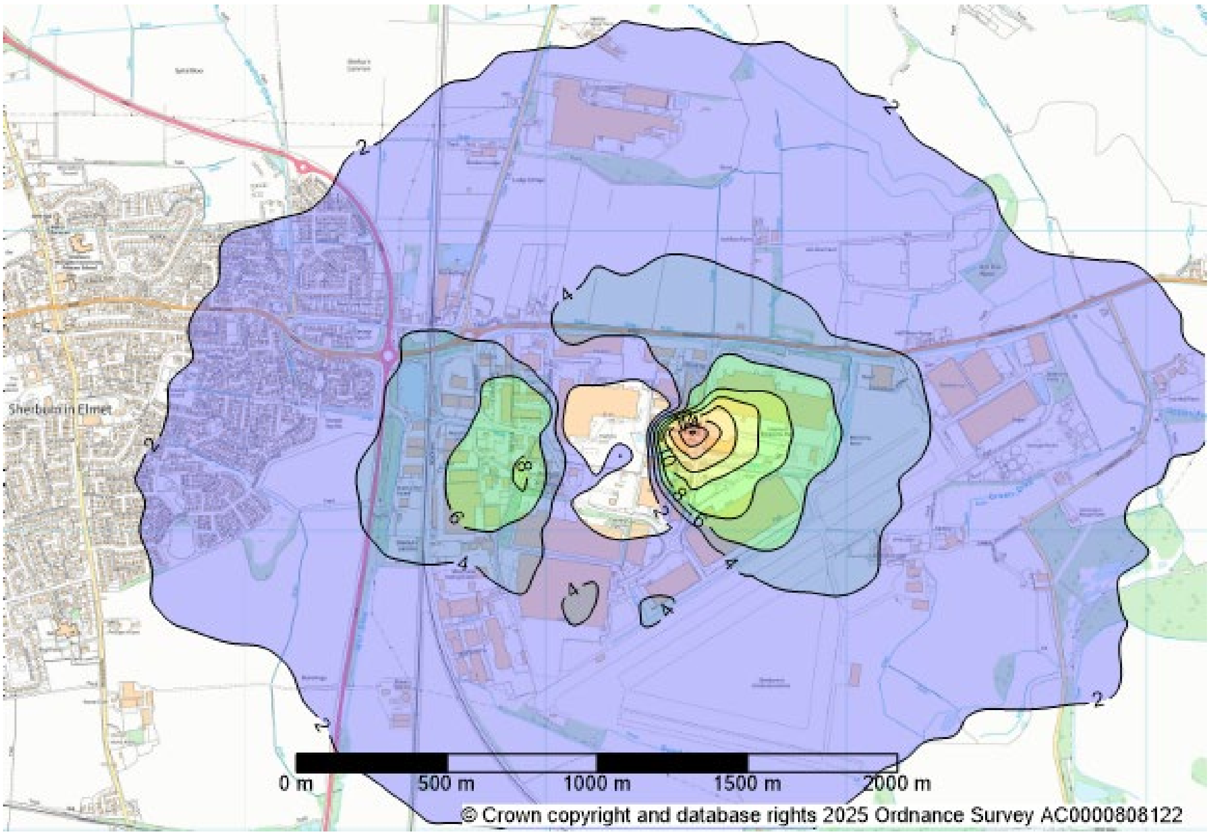


Figure 5.2: Predicted 99.8th Percentile of Hourly Mean NO_2 Concentrations for 2023 (µg/m³)

5.1.3 Carbon Monoxide

Maximum predicted 8-hour and 1-hour mean ground level CO process contributions are presented in Table 5.2.

Table 5.2: Predicted CO Concentrations (µg/m³)

Receptor	8-Hour Mean		1-Hour Mean	
	PC (µg/m³)	PC (% AQAL)	PC (µg/m³)	PC (% AQAL)
Maximum Off-Site	18.5	0.2%	23.7	0.1%
R1 Cafe	8.6	0.1%	9.8	<0.1%
R2 Fitness Studio	10.2	0.1%	12.2	<0.1%
R3 Lennerton Lodge	4.6	<0.1%	5.2	<0.1%
R4 Bishopdyke Road	4.4	<0.1%	5.5	<0.1%
R5 Low Hall Farm	2.4	<0.1%	4.0	<0.1%
R6New Lennerton Lane	2.6	<0.1%	4.4	<0.1%
R7 Bishopdyke Road	5.9	0.1%	6.8	<0.1%
R8 Bishopdyke Road	4.7	<0.1%	5.9	<0.1%
R9 Bishopdyke Road	3.8	<0.1%	5.1	<0.1%
R10 Moor Lane	4.1	<0.1%	4.6	<0.1%
R11 Saxon Court	3.9	<0.1%	5.0	<0.1%

R12 Saxon Mews	4.0	<0.1%	4.9	<0.1%
R13 Damson Drive	3.5	<0.1%	4.5	<0.1%
R14 Blenheim Garth	3.2	<0.1%	4.2	<0.1%
R15 Norden's Barn Farm	2.2	<0.1%	3.9	<0.1%
R16 Proposed housing (Local Plan)	3.8	<0.1%	5.4	<0.1%
AQAL (µg/m^3)	10,000		30,000	
Background (µg/m^3)	189		270	
Maximum PEC	207		294	
Maximum PEC (% AQAL)	2.1%		1.0%	

The predicted maximum CO concentrations at sensitive receptor locations are well below the maximum 8-hour and 1-hour mean AQAL. Furthermore, the maximum 8-hour and 1-hour concentrations are well below the Environment Agency's 10% short-term screening criteria. Therefore, the impact of CO emissions from the installation are assessed as not significant.

5.1.4 Sulphur Dioxide (SO_2)

The predicted SO_2 process contributions are presented in **Table 5.3**. Predicted concentrations for 2023 as the 99.2nd percentile of 24-hour means are presented in **Figure 5.3**.

Table 5.3: Predicted SO_2 Concentrations (µg/m^3)

Receptor	99.2nd Percentile of 24-Hour Means		99.7th Percentile of 1-Hour Means		99.9th Percentile of 15-Minute Means	
	PC (µg/m^3)	PC (% AQAL)	PC (µg/m^3)	PC (% AQAL)	PC (µg/m^3)	PC (% AQAL)
Maximum Off-Site	7.7	6.1%	13.1	3.8%	14.6	5.5%
R1 Cafe	2.1	1.7%	4.9	1.4%	5.4	2.0%
R2 Fitness Studio	2.9	2.3%	5.6	1.6%	6.8	2.6%
R3 Lennerton Lodge	1.8	1.4%	2.9	0.8%	3.5	1.3%
R4 Bishopdyke Road	1.3	1.1%	2.8	0.8%	3.6	1.4%
R5 Low Hall Farm	0.71	0.6%	1.6	0.5%	2.5	0.9%
R6New Lennerton Lane	0.66	0.5%	1.7	0.5%	2.4	0.9%
R7 Bishopdyke Road	2.1	1.7%	3.6	1.0%	4.0	1.5%
R8 Bishopdyke Road	1.3	1.0%	2.9	0.8%	3.4	1.3%
R9 Bishopdyke Road	1.0	0.8%	2.6	0.8%	3.0	1.1%
R10 Moor Lane	1.2	1.0%	2.5	0.7%	3.0	1.1%
R11 Saxon Court	1.5	1.2%	2.6	0.7%	3.1	1.2%
R12 Saxon Mews	1.5	1.2%	2.7	0.8%	3.1	1.2%
R13 Damson Drive	1.0	0.8%	2.2	0.6%	2.6	1.0%
R14 Blenheim Garth	1.2	0.9%	2.0	0.6%	2.5	0.9%

R15 Norden's Barn Farm	0.69	0.6%	1.4	0.4%	1.7	0.6%
R16 Proposed housing (Local Plan)	1.4	1.2%	2.6	0.7%	3.2	1.2%
AQAL ($\mu g/m^3$)	125		350		266	
Background ($\mu g/m^3$)	8.9		15.0		20.1	
Maximum PEC	16.5		28.1		34.7	
Maximum PEC (% AQAL)	13.2%		8.0%		13.0%	

Predicted maximum SO_2 concentrations at receptor locations are substantially below the relevant short-term AQALs.

The contribution from the installation (PC) is less than 10% of the 24-hour, 1-hour mean and 15-minute AQALs at all off-site locations and would be assessed as not significant according to the Environment Agency's Risk Assessment Guidance.

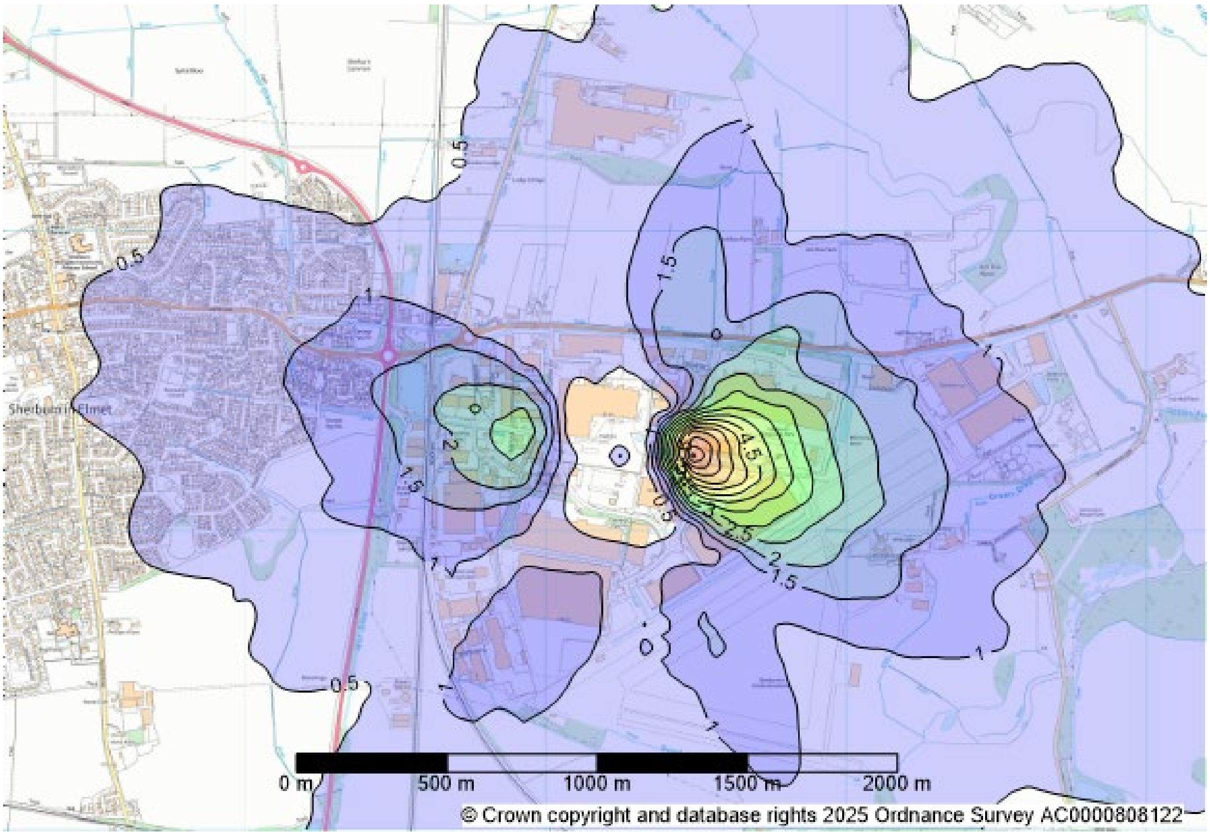


Figure 5.3: Predicted 99.2nd Percentile of 24-hour Mean SO_2 Concentrations 2023 ($\mu g/m^3$)

5.1.5 Particulate Matter (as PM_{10})

Predicted annual mean and 90.4th percentile of 24-hour mean PM_{10} concentrations at the selected receptor locations are presented in **Table 5.4.** The predictions assume that 100% of the particulate matter emitted from the stack is in the PM_{10} fraction. A contour plot of 90.4th percentile of 24-hour means for 2023 is presented in **Figure 5.4.**

Table 5.4: Predicted PM_{10} Concentrations (µg/m^3)

Receptor	Annual Mean		90.4th Percentile of 24-Hour Means	
	PC (µg/m^3)	PC (% AQAL)	PC (µg/m^3)	PC (% AQAL)
Maximum Off-Site	0.14	0.4%	0.56	1.1%
R1 Cafe	0.017	<0.1%	0.052	0.1%
R2 Fitness Studio	0.014	<0.1%	0.034	0.1%
R3 Lennerton Lodge	0.037	0.1%	0.15	0.3%
R4 Bishopdyke Road	0.028	0.1%	0.11	0.2%
R5 Low Hall Farm	0.016	<0.1%	0.056	0.1%
R6New Lennerton Lane	0.016	<0.1%	0.057	0.1%
R7 Bishopdyke Road	0.036	0.1%	0.12	0.2%
R8 Bishopdyke Road	0.0089	<0.1%	0.026	0.1%
R9 Bishopdyke Road	0.010	<0.1%	0.033	0.1%
R10 Moor Lane	0.011	<0.1%	0.035	0.1%
R11 Saxon Court	0.014	<0.1%	0.055	0.1%
R12 Saxon Mews	0.016	<0.1%	0.066	0.1%
R13 Damson Drive	0.013	<0.1%	0.057	0.1%
R14 Blenheim Garth	0.0092	<0.1%	0.038	0.1%
R15 Norden's Barn Farm	0.0081	<0.1%	0.035	0.1%
R16 Proposed housing (Local Plan)	0.0095	<0.1%	0.029	0.1%
AQAL (µg/m^3)	40		50	
Background (µg/m^3)	13.3		15.7	
Maximum PEC	13.4		16.2	
Maximum PEC (% AQAL)	33.6%		32.5%	

The maximum predicted PM_{10} concentrations are less than 1% and 10% of the relevant long and short-term AQALs respectively and would be assessed as not significant.

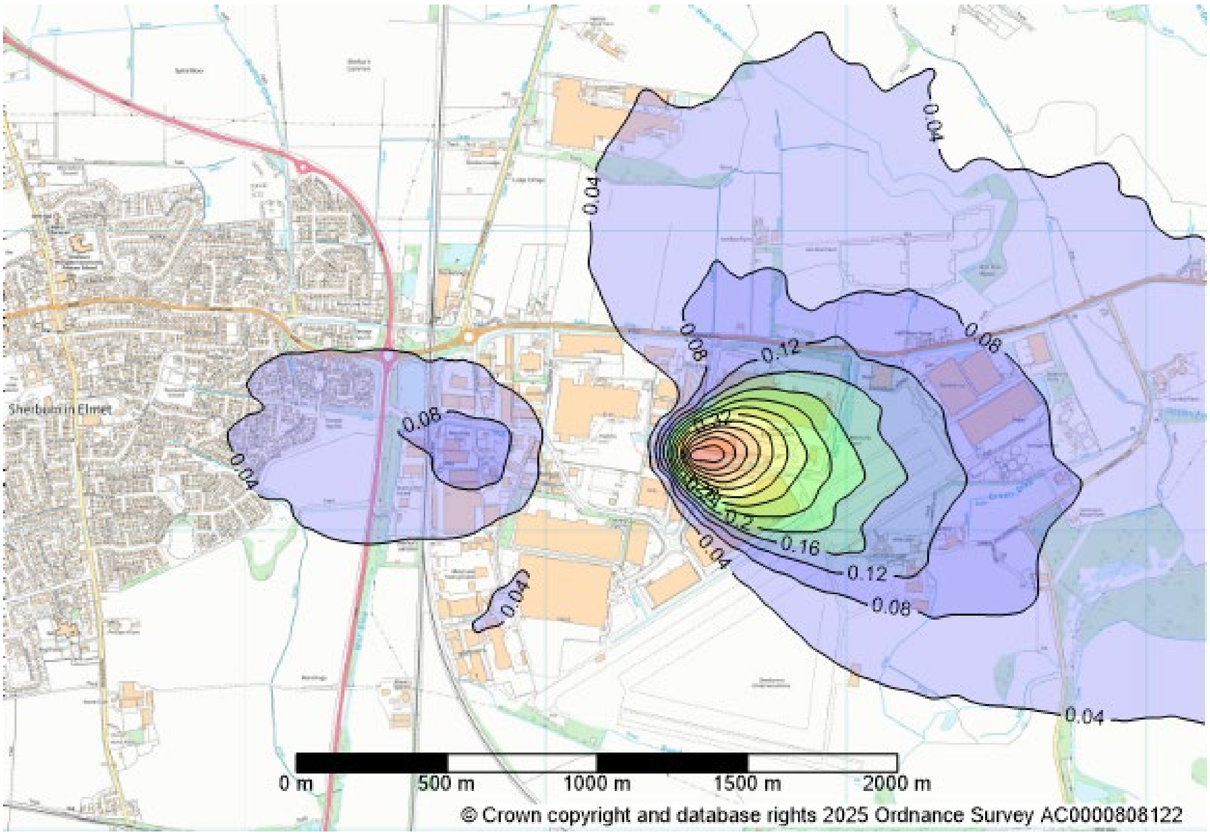


Figure 5.4: Predicted 90.4th Percentile of 24-hour Mean PM_{10} Concentrations 2023 ($\mu g/m^3$)

5.1.6 Particulate Matter (as $PM_{2.5}$)

Predicted annual mean $PM_{2.5}$ process contributions are presented in **Table 5.5.** The predictions assume that 100% of the particulate matter emitted from the stack is in the $PM_{2.5}$ fraction. A contour plot of annual mean $PM_{2.5}$ (and PM_{10}) concentrations for 2023 is presented in **Figure 5.5.**

Table 5.5: Predicted $PM_{2.5}$ Concentrations ($\mu g/m^3$)

Receptor	Annual Mean	
	PC ($\mu g/m^3$)	PC (% AQAL)
Maximum Off-Site	0.14	0.7%
R1 Cafe	0.017	0.1%
R2 Fitness Studio	0.014	0.1%
R3 Lennerton Lodge	0.037	0.2%
R4 Bishopdyke Road	0.028	0.1%
R5 Low Hall Farm	0.016	0.1%
R6New Lennerton Lane	0.016	0.1%
R7 Bishopdyke Road	0.036	0.2%
R8 Bishopdyke Road	0.0089	<0.1%
R9 Bishopdyke Road	0.010	0.1%
R10 Moor Lane	0.011	0.1%

R11 Saxon Court	0.014	0.1%
R12 Saxon Mews	0.016	0.1%
R13 Damson Drive	0.013	0.1%
R14 Blenheim Garth	0.0092	<0.1%
R15 Norden's Barn Farm	0.0081	<0.1%
R16 Proposed housing (Local Plan)	0.0095	<0.1%
AQAL (µg/m^3)	20	
Background (µg/m^3)	6.4	
Maximum PEC	6.5	
Maximum PEC (% AQAL)	32.7%	

The maximum annual mean $PM_{2.5}$ concentration is just 0.7% of the EU limit value of 20 µg/m^3 and would be assessed as not significant. Compared to the AMCT of 10 µg/m^3 (to be met by 2040), the PC would be 1.4% of the limit and would be potentially significant. However, the PEC would only be 65% of the AMCT and it is unlikely that this would be exceeded. Furthermore, given the policies and regulations to reduce concentrations of $PM_{2.5}$, it is likely that background concentrations of $PM_{2.5}$ in the future would be lower than current levels.

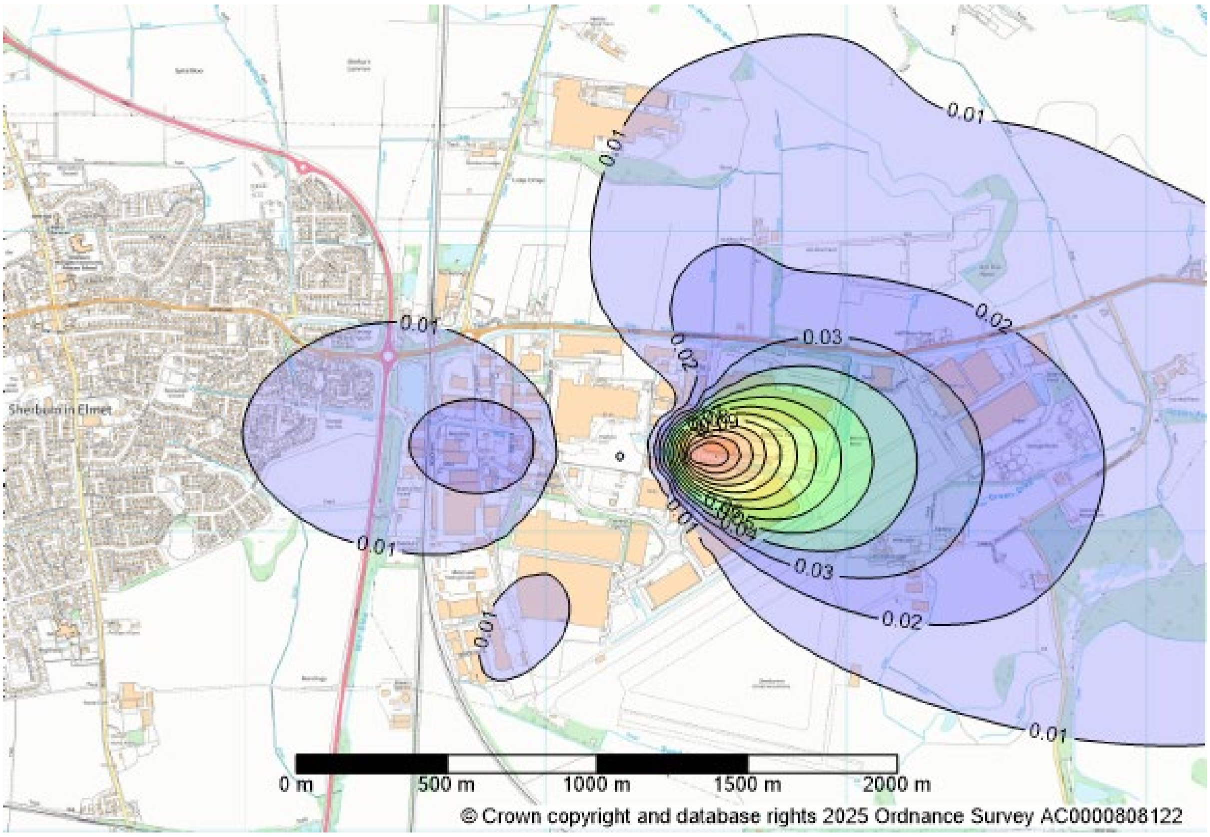


Figure 5.5: Predicted Annual Mean $PM_{2.5}$ (and PM_{10}) Concentrations 2023 (µg/m^3)

5.1.7 Total Organic Carbon (as Benzene)

Predicted annual mean and 24-hour mean ground-level benzene concentrations (PC) are presented in **Table 5.6.** This assumes that all of the total organic carbon (TOC) emitted from the facility comprises entirely of benzene and represents a worst-case.

Table 5.6: Predicted Benzene Concentrations (µg/m^3)

Receptor	Annual Mean		24-hour Mean	
	PC (µg/m^3)	PC (% AQAL)	PC (µg/m^3)	PC (% AQAL)
Maximum Off-Site	0.28	5.6%	2.9	9.8%
R1 Cafe	0.035	0.7%	1.4	4.8%
R2 Fitness Studio	0.029	0.6%	1.7	5.8%
R3 Lennerton Lodge	0.074	1.5%	0.66	2.2%
R4 Bishopdyke Road	0.056	1.1%	0.55	1.8%
R5 Low Hall Farm	0.033	0.7%	0.30	1.0%
R6New Lennerton Lane	0.032	0.6%	0.29	1.0%
R7 Bishopdyke Road	0.071	1.4%	0.99	3.3%
R8 Bishopdyke Road	0.018	0.4%	0.66	2.2%
R9 Bishopdyke Road	0.021	0.4%	0.45	1.5%
R10 Moor Lane	0.023	0.5%	0.47	1.6%
R11 Saxon Court	0.028	0.6%	0.55	1.8%
R12 Saxon Mews	0.031	0.6%	0.68	2.3%
R13 Damson Drive	0.026	0.5%	0.62	2.1%
R14 Blenheim Garth	0.018	0.4%	0.44	1.5%
R15 Norden's Barn Farm	0.016	0.3%	0.25	0.8%
R16 Proposed housing (Local Plan)	0.019	0.4%	0.55	1.8%
AQAL	5		30	
Background	0.30		0.35	
Maximum PEC	0.58		3.3	
Maximum PEC (% AQAL)	11.6%		11.0%	

The maximum annual mean benzene concentration is 5.6% of the AQAL and is potentially significant. However, the PEC is 11.6% of the AQAL and it is concluded that it is unlikely that the AQAL would be exceeded.

The maximum predicted 24-hour mean concentrations is less than 10% of the short-term AQAL for all receptors and would be assessed as not significant.

5.1.8 Hydrogen Chloride

Predicted annual mean ground-level HCl concentrations (PC) are presented in **Table 5.7.** The maximum predicted hourly mean concentrations are less than 10% of the AQAL and would be assessed as not significant.

Table 5.7: Predicted HCl Concentrations (μg/m^3)

Receptor	1-Hour Mean	
	PC (μg/m^3)	PC (% AQAL)
Maximum Off-Site	2.8	0.4%
R1 Cafe	1.2	0.2%
R2 Fitness Studio	1.5	0.2%
R3 Lennerton Lodge	0.63	0.1%
R4 Bishopdyke Road	0.66	0.1%
R5 Low Hall Farm	0.48	0.1%
R6New Lennerton Lane	0.53	0.1%
R7 Bishopdyke Road	0.82	0.1%
R8 Bishopdyke Road	0.71	0.1%
R9 Bishopdyke Road	0.61	0.1%
R10 Moor Lane	0.55	0.1%
R11 Saxon Court	0.59	0.1%
R12 Saxon Mews	0.59	0.1%
R13 Damson Drive	0.54	0.1%
R14 Blenheim Garth	0.50	0.1%
R15 Norden's Barn Farm	0.47	0.1%
R16 Proposed housing (Local Plan)	0.65	0.1%
AQAL	750	
Background	2.0	
Maximum PEC	4.8	
Maximum PEC (% AQAL)	0.6%	

5.1.9 Hydrogen Fluoride

The predicted maximum monthly (weekly) and 1-hour mean ground-level hydrogen fluoride concentrations are presented in **Table 5.8**. The ADMS model is unable to predict monthly mean concentrations and as a worst-case the maximum weekly mean concentrations are presented.

Table 5.8: Predicted HF Concentrations (µg/m³)

Receptor	Monthly (Weekly) Mean		1-Hour Mean	
	PC	PC (% AQAL)	PC	PC (% AQAL)
Maximum Off-Site	0.11	0.7%	0.47	0.3%
R1 Cafe	0.037	0.2%	0.20	0.1%
R2 Fitness Studio	0.068	0.4%	0.24	0.2%
R3 Lennerton Lodge	0.039	0.2%	0.10	0.1%
R4 Bishopdyke Road	0.022	0.1%	0.11	0.1%
R5 Low Hall Farm	0.011	0.1%	0.081	0.1%
R6 New Lennerton Lane	0.012	0.1%	0.088	0.1%
R7 Bishopdyke Road	0.035	0.2%	0.14	0.1%
R8 Bishopdyke Road	0.018	0.1%	0.12	0.1%
R9 Bishopdyke Road	0.021	0.1%	0.10	0.1%
R10 Moor Lane	0.018	0.1%	0.091	0.1%
R11 Saxon Court	0.021	0.1%	0.099	0.1%
R12 Saxon Mews	0.022	0.1%	0.099	0.1%
R13 Damson Drive	0.024	0.1%	0.091	0.1%
R14 Blenheim Garth	0.020	0.1%	0.083	0.1%
R15 Norden's Barn Farm	0.010	0.1%	0.078	<0.1%
R16 Proposed housing (Local Plan)	0.026	0.2%	0.11	0.1%
AQAL	16		160	
Background	0.2		0.2	
Maximum PEC	0.31		0.67	
Maximum PEC (% AQAL)	2.0%		0.4%	

The maximum monthly (weekly) mean HF concentration is 0.7% of the AQAL and the impact would be assessed as not significant. The maximum short-term HF concentrations are less than 10% of the AQAL at all off-site locations and would also be assessed as not significant.

5.1.10 Dioxins and Furans

The predicted annual mean ground-level dioxin and furan process contributions at identified sensitive receptor locations are presented in **Table 5.9**. The results are presented in femtograms (fg) per cubic metre (10^{-15} g/m³).

Table 5.9: Predicted Dioxin and Furan Concentrations (fg/m³)

Receptor	Annual Mean	
	PC (fg/m³)	PC (% Background)
Maximum Off-Site	1.7	52.5%

R1 Cafe	0.21	6.5%
R2 Fitness Studio	0.17	5.4%
R3 Lennerton Lodge	0.45	13.9%
R4 Bishopdyke Road	0.34	10.6%
R5 Low Hall Farm	0.20	6.1%
R6New Lennerton Lane	0.19	5.9%
R7 Bishopdyke Road	0.43	13.4%
R8 Bishopdyke Road	0.11	3.3%
R9 Bishopdyke Road	0.12	3.9%
R10 Moor Lane	0.14	4.3%
R11 Saxon Court	0.17	5.2%
R12 Saxon Mews	0.19	5.9%
R13 Damson Drive	0.16	4.9%
R14 Blenheim Garth	0.11	3.5%
R15 Norden's Barn Farm	0.10	3.0%
R16 Proposed housing (Local Plan)	0.11	3.6%
Background	3.2	

There are no assessment criteria for dioxins and furans. The predicted maximum contribution from the installation at any location is 52.5% of the average background concentration measured at rural monitoring sites in the UK. The impact of dioxin emissions on human health is provided in the human health risk assessment (HHRA) submitted in support of the permit application.

5.1.11 PAH (as Benzo[a]pyrene)

The maximum predicted annual mean ground level BaP process contributions are presented in **Table 5.10.** The results are presented in nanograms (ng) per cubic metre (10^{-9} g/m^3). This assumes as a worst-case that all of the PAH emission comprises BaP.

Table 5.10: Predicted BaP Concentrations (ng/m^3)

Receptor	Annual Mean	
	PC (ng/m^3)	PC (% AQAL)
Maximum Off-Site	0.0025	1.0%
R1 Cafe	0.00031	0.1%
R2 Fitness Studio	0.00026	0.1%
R3 Lennerton Lodge	0.00067	0.3%
R4 Bishopdyke Road	0.00051	0.2%
R5 Low Hall Farm	0.00029	0.1%
R6New Lennerton Lane	0.00029	0.1%
R7 Bishopdyke Road	0.00064	0.3%

R8 Bishopdyke Road	0.00016	0.1%
R9 Bishopdyke Road	0.00019	0.1%
R10 Moor Lane	0.00021	0.1%
R11 Saxon Court	0.00025	0.1%
R12 Saxon Mews	0.00028	0.1%
R13 Damson Drive	0.00023	0.1%
R14 Blenheim Garth	0.00017	0.1%
R15 Norden's Barn Farm	0.00015	0.1%
R16 Proposed housing (Local Plan)	0.00017	0.1%
AQAL	0.25	
Background	0.18	
Maximum PEC	0.18	
Maximum PEC (% AQAL)	73.0%	

The maximum predicted off site concentration is 1.0% of the AQAL and would be assessed as not significant. At sensitive receptor locations where there is relevant public exposure, predicted concentrations are 0.3% or less compared to the AQAL.

5.1.12 Polychlorinated Biphenyls

The predicted annual mean and maximum 1 hour mean ground level PCB process contributions are presented in **Table 5.11.** The results are presented in nanograms (ng) per cubic metre (10^{-9} g/m^3).

Table 5.11: Predicted PCB Concentrations (ng/m^3)

Receptor	Annual Mean		1-Hour Mean	
	PC (ng/m^3)	PC (% AQAL)	PC (ng/m^3)	PC (% AQAL)
Maximum Off-Site	0.14	0.1%	2.4	<0.1%
R1 Cafe	0.017	<0.1%	0.98	<0.1%
R2 Fitness Studio	0.014	<0.1%	1.2	<0.1%
R3 Lennerton Lodge	0.037	<0.1%	0.52	<0.1%
R4 Bishopdyke Road	0.028	<0.1%	0.55	<0.1%
R5 Low Hall Farm	0.016	<0.1%	0.40	<0.1%
R6New Lennerton Lane	0.016	<0.1%	0.44	<0.1%
R7 Bishopdyke Road	0.036	<0.1%	0.68	<0.1%
R8 Bishopdyke Road	0.0089	<0.1%	0.59	<0.1%
R9 Bishopdyke Road	0.010	<0.1%	0.51	<0.1%
R10 Moor Lane	0.011	<0.1%	0.46	<0.1%
R11 Saxon Court	0.014	<0.1%	0.50	<0.1%
R12 Saxon Mews	0.016	<0.1%	0.49	<0.1%
R13 Damson Drive	0.013	<0.1%	0.45	<0.1%

R14 Blenheim Garth	0.0092	<0.1%	0.42	<0.1%
R15 Norden's Barn Farm	0.0081	<0.1%	0.39	<0.1%
R16 Proposed housing (Local Plan)	0.0095	<0.1%	0.54	<0.1%
AQAL	200		6000	
Background	0.024		0.048	
Maximum PEC	0.16		2.4	
Maximum PEC (% AQAL)	0.1%		<0.1%	

Maximum predicted ground level annual mean and 1-hour mean PCB concentrations are less than 1% and 10% of the long and short-term AQALs, respectively. Therefore, the impact would be assessed as not significant.

5.1.13 Trace Metals

5.1.13.1 Step 1: Emissions at the Group ELV

The predicted maximum long and short-term trace metal concentrations for emissions at the maximum BREF limits are presented in **Table 5.12** and **Table 5.13,** respectively. This assumes that each metal is emitted at the ELV for the group.

For the Step 1 screening it is assumed that for chromium VI the predicted PC and background concentrations are apportioned 20% of the total chromium.

Table 5.12: Predicted Maximum Long Term Trace Metal Concentrations - Step 1

Pollutant	EAL (ng/m^3)	Max. PC (ng/m^3)	Background (ng/m^3)	PC (% AQAL)	PEC (% of AQAL)	Further Assessment Required?
Cadmium (Cd)	5	0.56	0.26	11.2%	16.4%	No
Thallium (Tl)	1,000	0.56	-	0.1%	0.1%	No
Mercury (Hg)	60	5.9	3.2	9.8%	15.1%	No
Antimony (Sb)	5,000	8.4	-	0.2%	0.2%	No
Arsenic (As)	**6**	**8.4**	**0.8**	**140.0%**	**153.3%**	**Yes**
Chromium (Cr)	2,000	88.3	38.1	4.4%	6.3%	No
Chromium VI	**0.25**	**1.7**	**6.5**	**672.0%**	**3256%**	**Yes**
Cobalt (Co)	1,000	8.4	0.64	0.8%	0.9%	No
Copper (Cu)	**50**	**88.3**	**17.3**	**176.6%**	**211.3%**	**Yes**
Manganese (Mn)	150	8.4	32.0	5.6%	26.9%	No
Nickel (Ni)	**20**	**8.4**	**13.5**	**42.0%**	**109.5%**	**Yes**
Lead (Pb)	250	8.4	11.7	3.4%	8.0%	No

Table 5.13: Predicted Maximum Short Term Trace Metal Concentrations - Step 1

Pollutant	AQAL (ng/m^3)	Max. PC (ng/m^3)	Background (ng/m^3)	PC (% AQAL)	PEC (% AQAL)	Further Assessment Required?
Cd (24-hour)	30	5.9	0.31	19.6%	20.6%	No
Hg (1-hour)	600	9.5	5.4	1.6%	2.5%	No
Sb (1-hour)	150,000	142	-	0.1%	0.1%	No
Mn (1-hour)	1,500,000	142	64.0	<0.1%	<0.1%	No
Ni (1-hour)	700	142	27.0	20.3%	24.2%	No
V (24-hour)	1,000	88.3	1.3	8.8%	9.0%	No

On the basis of the Step 1 screening, further assessment is required for long-term arsenic (annual mean), chromium (VI) (annual mean), copper (24-hour long-term mean) and nickel (annual mean).

The maximum predicted short-term impacts are well below the relevant AQALs and for all metals the PCs are less than 10% and/or the PECs are less than 100% of the relevant AQAL. Therefore, these can all be screened from further assessment.

5.1.13.2 Step 2: Typical Operational Emissions

The Environment Agency guidance note for the assessment of Group III metals provides measured concentrations of emissions of metals from waste Incinerators. In accordance with the guidance note, revised concentrations for As, CrVI, Cu and Ni have been predicted using the maximum measured emission concentration (0.025 mg/Nm^3, 0.00013 mg/Nm^3, 0.029 mg/Nm^3 and 0.053 mg/Nm^3 for As, CrVI, Cu and Ni, respectively). Except for Ni, these are the maximum measured concentrations and for Ni the third highest concentration is used as the highest two values were identified by the Environment Agency as outliers. For these typical emission concentrations, maximum predicted ground level concentrations are presented in **Table 5.14.**

Table 5.14: Maximum Long Term Trace Metal Concentrations – Typical Emissions

Pollutant	EAL (ng/m^3)	PC (ng/m^3)	PC (% of EAL)	PEC (% of EAL)	Further Assessment Required?
As – annual mean	6	0.70	11.7%	25.0%	No
Cr (VI) (a) – annual mean	**0.25**	**0.0036**	**1.5%**	**2585%**	**Yes**
Cu – 24-hour mean (long-term)	50	8.5	17.1%	51.8%	No
Ni – annual mean	20	1.5	7.4%	74.9%	No
(a) The background concentrations is apportioned 20% Cr(VI) in accordance with the Environment Agency's guidance.					

On the basis of Step 2 of the assessment, further assessment is required for CrVI. For CrVI, the PEC significantly exceeds the target value but this is due to the assumed background concentration that is almost 26 times the target value. The installation contributes 1.5% and would be assessed as potentially significant.

However, this is the maximum predicted anywhere within the model domain and occurs to the immediate east of the site within the industrial estate. There would be no relevant public exposure (e.g. residential receptors) at this location. Predicted CrVI concentrations at sensitive receptors are presented in **Table 5.15.**

Table 5.15: Predicted Typical CrVI Concentrations at Sensitive Receptors (ng/m^3)

Receptor	Annual Mean	
	PC (ng/m^3)	PC (% AQAL)
R1 Cafe	0.00045	0.2%
R2 Fitness Studio	0.00037	0.1%
R3 Lennerton Lodge	0.00097	0.4%
R4 Bishopdyke Road	0.00073	0.3%
R5 Low Hall Farm	0.00042	0.2%
R6New Lennerton Lane	0.00041	0.2%
R7 Bishopdyke Road	0.00093	0.4%
R8 Bishopdyke Road	0.00023	0.1%
R9 Bishopdyke Road	0.00027	0.1%
R10 Moor Lane	0.00030	0.1%
R11 Saxon Court	0.00036	0.1%
R12 Saxon Mews	0.00041	0.2%
R13 Damson Drive	0.00034	0.1%
R14 Blenheim Garth	0.00024	0.1%
R15 Norden's Barn Farm	0.00021	0.1%
R16 Proposed housing (Local Plan)	0.00025	0.1%
AQAL	0.25	

At all sensitive receptors the PC is less than 1% of the AQAL and would be assessed as not significant. A contour plot of predicted annual mean CrVI concentrations is presented in **Figure 5.7.** The 0.0025 ng/m^3 contour line is highlighted in red and represents 1% of the AQAL of 0.25 ng/m^3. Beyond the industrial estate predicted concentrations of CrVI are well below 1% of the AQAL and would be assessed as not significant.

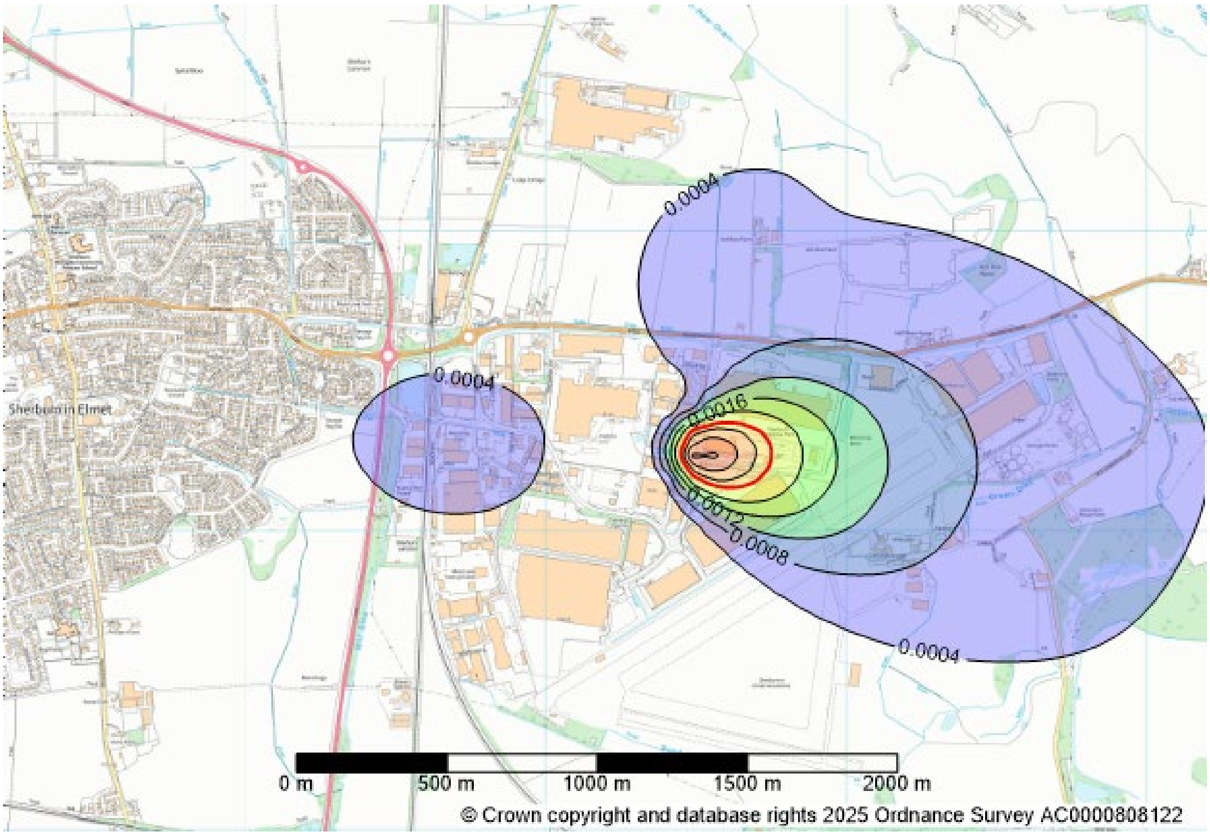


Figure 5.6: Predicted Annual Mean CrVI Concentrations 2023 (ng/m³)

5.1.14 Ammonia

The predicted maximum annual mean and 1-hour mean ground level ammonia concentrations at identified sensitive receptor locations are presented as a percentage of the AQAL in **Table 5.16.**

Table 5.16: Predicted Ammonia Concentrations (µg/m³)

Receptor	Annual Mean		Maximum 1-Hour Mean	
	PC (µg/m³)	PC (% AQAL)	PC (µg/m³)	PC (% AQAL)
Maximum Off-Site	0.28	0.2%	4.7	0.2%
R1 Cafe	0.035	<0.1%	2.0	0.1%
R2 Fitness Studio	0.029	<0.1%	2.4	0.1%
R3 Lennerton Lodge	0.074	<0.1%	1.0	<0.1%
R4 Bishopdyke Road	0.056	<0.1%	1.1	<0.1%
R5 Low Hall Farm	0.033	<0.1%	0.81	<0.1%
R6New Lennerton Lane	0.032	<0.1%	0.88	<0.1%
R7 Bishopdyke Road	0.071	<0.1%	1.4	0.1%
R8 Bishopdyke Road	0.018	<0.1%	1.2	<0.1%
R9 Bishopdyke Road	0.021	<0.1%	1.0	<0.1%
R10 Moor Lane	0.023	<0.1%	0.91	<0.1%
R11 Saxon Court	0.028	<0.1%	0.99	<0.1%

R12 Saxon Mews	0.031	<0.1%	0.99	<0.1%
R13 Damson Drive	0.026	<0.1%	0.91	<0.1%
R14 Blenheim Garth	0.018	<0.1%	0.83	<0.1%
R15 Norden's Barn Farm	0.016	<0.1%	0.78	<0.1%
R16 Proposed housing (Local Plan)	0.019	<0.1%	1.1	<0.1%
AQAL (µg/m^3)	180		2500	
Background (µg/m^3)	1.7		3.4	
Maximum PEC	2.0		8.1	
Maximum PEC (% AQAL5.2)	1.1%		0.3%	

The maximum predicted NH_3 concentrations are less than 1% and 10% of the long and short-term AQALs, respectively. In accordance with the Environment Agency's Risk Assessment Guidance the impact at all receptors would be assessed as not significant.

5.2 Habitat Impact

5.2.1 Airborne Concentrations of NOx, SO_2, NH_3 and HF

Predicted maximum ground level concentrations of NOx, SO_2, NH_3 and HF at the identified habitat sites are compared with the relevant critical levels (CL) in **Table 5.17** to **5.20** for NOx, SO_2, NH_3 and HF, respectively.

Table 5.17: Predicted Maximum NOx Concentrations

Habitat Site	Annual Mean NO_x (µg/m^3)	Percentage of CL	24-hour Mean (µg/m^3)	Percentage of CL
H1 Pasture Opposite Gypsum Works LWS	0.19	0.6%	4.6	6.1%
H2 Ash Tree Dike and Ponds LWS	0.14	0.5%	3.5	4.6%
Critical Level (CL)	*30*		*75*	

Predicted concentrations of NO_x at both LWS are less than 100% of the long-term and short-term critical levels. Therefore, the impact of NO_x emissions on habitat sites would be assessed as not significant.

For SO_2 and NH_3, there are two critical levels depending on the presence of lichens. For the LWS, there is little information available on the likely presence of lichens. Therefore, the more stringent critical levels of 10 µg/m^3 for SO_2 and 1 µg/m^3 for NH_3 have been adopted for these habitats. Predicted SO_2 concentrations are presented in **Table 5.18** and NH_3 in **Table 5.19.**

Table 5.18: Predicted Maximum SO_2 Concentrations

Habitat Site	Annual Mean SO_2 (µg/m^3)	Percentage of CL
H1 Pasture Opposite Gypsum Works LWS	0.048	0.5%
H2 Ash Tree Dike and Ponds LWS	0.035	0.3%
Critical Level	*10 - 20*	

Predicted concentrations of SO_2 at the two LWS are less than 100% of the long-term critical level. Therefore, the impact of SO_2 emissions on habitat sites would be assessed as not significant.

Table 5.19: Predicted Maximum NH_3 Concentrations

Habitat Site	Annual Mean NH_3 (µg/m^3)	Percentage of CL
H1 Pasture Opposite Gypsum Works LWS	0.016	1.6%
H2 Ash Tree Dike and Ponds LWS	0.012	1.2%
Critical Level	*1 - 3*	

Predicted concentrations of NH_3 at the two LWS are less than 100% of the long-term critical level. Therefore, the impact of NH_3 emissions on habitat sites would be assessed as not significant.

Table 5.20: Predicted Maximum HF Concentrations

Habitat Site	Weekly Mean HF (µg/m^3)	Percentage of CL	24-hour Mean HF (µg/m^3)	Percentage of CL
H1 Pasture Opposite Gypsum Works LWS	0.0084	1.7%	0.038	0.8%
H2 Ash Tree Dike and Ponds LWS	0.0095	1.9%	0.029	0.6%
Critical Level	*0.5*		*5*	

Predicted concentrations of HF at the two LWS are less than 100% of the weekly mean critical level and the 24-hour mean critical level. Therefore, the impact of HF emissions on habitat sites would be assessed as not significant.

5.2.2 Nutrient Nitrogen Deposition

Predicted maximum nutrient nitrogen deposition rates are compared with the lower critical load for in **Table 5.21**.

Table 5.21: Predicted Nutrient Nitrogen Deposition Rate (kgN/ha/a)

Habitat Site	PC (kgN/ha/a)	Background Deposition (kgN/ha/a)	Total Deposition (kgN/ha/a)	Critical Load (kgN/ha/a)	PC (as %age of CL)
H1 Pasture Opposite Gypsum Works LWS	0.11	14.13	14.24	10	1.1%
H2 Ash Tree Dike and Ponds LWS	0.080	14.01	14.09	10	1.6%

Due to the high background nitrogen deposition rates, the critical loads are exceeded at both of the habitat sites. However, the predicted contribution from the installation at the two LWS is less than 100% of the critical load and would be assessed as not significant.

5.2.3 Acidification

Predicted acidification rates are expressed as a percentage of the critical load function (CLF) in **Table 5.22.** At the two LWS, the predicted acid deposition rates due to emissions from the installation (PC) are less than 100% of the relevant critical load. Therefore, the impact would be assessed as not significant.

Table 5.22: Predicted Acidification Rates (keq/ha/a)

Habitat Site	PC (keq/ha/a)	PEC (keq/ha/a)	PC (as a %age of the CLF)
H1 Pasture Opposite Gypsum Works LWS	0.016	1.08	0.3%
H2 Ash Tree Dike and Ponds LWS	0.012	1.06	0.2%

5.3 Emissions at Half-hourly ELVs

The dispersion modelling results presented **Section 5.1** have been predicted assuming that the installation is operating for all hours in the year with the pollutant concentrations exactly at the daily emission limit value prescribed by the BREF BAT-AELs. This is an extreme assumption, especially for the annual average concentrations, since the facility could never operate with release rates as high as this in practice and remain compliant with legislation.

Short term peak concentrations may arise if the facility emits pollutants at levels approaching the half hourly limit values prescribed in the IED. These pollutants are particulate matter, nitrogen dioxide, sulphur dioxide, hydrogen chloride, hydrogen fluoride and carbon monoxide and have the following half-hourly emission limit values:

- total dust – 30 mg/Nm^3 (10 mg/Nm^3 97% compliance);
- hydrogen chloride – 60 mg/Nm^3 (10 mg/Nm^3 97% compliance);
- hydrogen fluoride – 4 mg/Nm^3 (2 mg/Nm^3 97% compliance);
- sulphur dioxide – 200 mg/Nm^3 (50 mg/Nm^3 97% compliance);
- oxides of nitrogen – 400 mg/Nm^3 (200 mg/Nm^3 97% compliance); and
- carbon monoxide – 100 mg/m^3.

Such excursions above daily limit values are permitted for only 3% of a year. The probability of such occasions occurring at the same time as the meteorological conditions that produce the highest one hour mean ground level concentrations is unlikely. On the basis of these worst-case assumptions, maximum predicted short-term concentrations for emissions at the half hourly limit values are provided in **Table 5.23**. It should be noted that these results represent a very worst-case and for some of the pollutants (NO_2, SO_2 and PM_{10}) there are a number of occasions when the AQAL can be exceeded.

Table 5.23: Maximum Predicted Short-term Concentrations at the Half-hourly ELVs

Pollutant	PC (µg/m^3)	PC (%)	PEC (%)
NO_2 (maximum 1-hour)	66.4	33.2%	43.1%

SO_2 (maximum 15-minute)	127.2	47.8%	51.1%
SO_2 (maximum 1-hour)	94.9	27.1%	31.4%
SO_2 (maximum 24-hour)	58.9	47.1%	63.2%
PM_{10} (maximum 24-hour)	8.8	17.7%	49.1%
HCl (maximum 1-hour)	28.5	3.8%	4.1%
HF (maximum 1-hour)	1.90	1.2%	1.3%
CO (maximum 8-hour)	36.9	0.4%	2.3%
CO (maximum 1-hour)	47.4	0.2%	1.1%

Predicted concentrations are between 0.2% and 47.8% of the short term AQAL. Highest concentrations relative to the AQAL are predicted for SO_2 as the 15-minute mean. The PEC for all pollutants and averaging periods are all well below 100% of the respective AQAL. On the basis of these worst-case results, it is very unlikely that the AQAL would be exceeded anywhere within the model domain. Therefore, it is concluded that emissions at the half hourly limits would not have a significant impact on air quality even assuming worst case dispersion conditions occurring during periods of elevated emissions.

5.4 Accidental Releases

5.4.1 Introduction

In the event of any process upset or mechanical failure the immediate action is to implement process controls, which ensure that standby equipment, where available and associated abatement systems are operational. In addition, various actions and monitoring procedures will be initiated by the Operator to ensure that combustion parameters and emissions remain within the Environmental Permit, thereby avoiding an abnormal operation where possible. If any process upset or mechanical failure results in a significant change to the emission conditions or process that cannot be easily and quickly remedied, the primary response from the operator will be to reduce load or initiate a controlled shutdown of the facility as appropriate.

Abnormal operation is not applicable to high CO or total organic carbon (TOC) emissions; in the event of emission levels of either being above the ELV the plant load would be reduced and a controlled shutdown initiated. Therefore, it is considered that periods where the plant continues to operate for extended periods with CO or TOC above the ELV would not occur.

5.4.2 Overview of Abnormal Emissions

In the event of any process upset or mechanical failure the immediate action is to implement process controls, which ensure that standby equipment, where available and associated abatement systems are operational. In addition, various actions and monitoring procedures will be initiated by the Operator to ensure that combustion parameters and emissions remain within the Environmental Permit, thereby avoiding an abnormal operation where possible. If any process upset or mechanical failure results in a significant change to the emission conditions or process that cannot be easily and quickly remedied, the primary response from the operator will be to reduce load or initiate a controlled shutdown of the facility as appropriate.

Abnormal operation is not applicable to high CO or total organic carbon (TOC) emissions; in the event of emission levels of either being above the ELV the plant load would be reduced and a controlled shutdown initiated. Therefore, it is considered that periods where the plant continues to operate for extended periods with CO or TOC above the ELV would not occur.

5.4.3 Approach

The abnormal modelling approach has considered the short-term impacts during periods of abnormal operation, assuming a worst case of complete abatement failure. A series of factors have been derived in order to ascertain the likely increases in emissions that may occur for each pollutant due to various foreseeable abnormal operations. For particulate matter, CO, and TOC the limits in Annex VI, Part 3 of the IED were used for this assessment.

The dispersion modelling approach used to assess impacts under normal operating conditions uses daily emission limits to predict short term ground level pollutant concentrations. These predictions are then compared to the relevant air quality standard. For the assessment of abnormal emissions, the impact on short term concentrations is of more importance since occasional excursions above the ELV would have negligible impact on long term air quality impacts. However, the long-term impact of abnormal conditions is considered for some pollutants namely dioxins and furans and PCBs.

5.4.4 Abnormal Emissions – Short-term Impacts

Article 46(6) of the IED states that ‘under no circumstances continue to incinerate waste for a period of more than 4 hours uninterrupted where emission limit values are exceeded’. In addition, Article 46(6) also states that ‘the cumulative duration of operation in such conditions over one year shall not exceed 60 hours’. Therefore, in order to assess the short-term ground level conditions that would result from the facility operating at a plausible abnormal operational emission level for four hours, the assessment has considered the short-term ground level concentrations where emissions occur at above half-hourly emission limits. The short-term emissions that are assumed to occur during abnormal conditions are presented in **Table 5.24.**

Table 5.24: Short-term Abnormal Emission Concentrations – Non-metals

Pollutant	Half-hour ELV (mg/Nm^3)	Assumed Daily ELV (mg/Nm^3)	Plausible Abnormal Emission (mg/Nm^3) (a)	Plausible Abnormal Emission (g/s)
NOx	400	120	500 (b)	25.5
SO_2	200	30	490 (15-minute) 490 (hourly) 107 (daily)	25.0 (c) 25.0 (c) 5.4 (c)(d)
Total dust (PM_{10})	30	5	29.2 (e)(f)	1.5
HCl	60	6	874	44.6 (g)
HF	4	1	146	7.4 (h)
CO	100	50	75 (8-hourly) (i) 100 (hourly)	3.8 5.1

PCBs	-	5.0 x 10^{-3} (j)	5.0 x 10^{-1} (k)	2.6 x 10^{-2}

(a) Abnormal emissions assumed to occur for 4 hours, for the remainder of the averaging period (e.g. for emissions with 24-hour or 8-hour AQAL) emissions are assumed to be at the daily ELV
(b) Highest unabated concentration for municipal waste provided in Table 3.6 of the BREF for waste Incineration
(c) Calculated from a fuel input of 30 t/h and a sulphur content of 0.15% by weight as provided by the operator
(d) Calculated as 4 hours at 490 mg/Nm^3 and 20 hours at 30 mg/Nm^3
(e) The maximum total dust emission is restricted to 150 mg/Nm^3 (Annex VI, Part 3(2) of the IED)
(f) Calculated as 4 hours at 150 mg/Nm^3 and 20 hours at 5 mg/Nm^3
(g) Calculated from a fuel input of 30 t/h and a chlorine content of 0.52% by weight as provided by the operator
(h) Assumed to be proportional to the emission concentrations for HCl and HF (i.e. 111 mg/Nm^3 times 1 divided by 6
(i) Calculated as 4 hours at 100 mg/Nm^3 and 4 hours at 50 mg/Nm^3, half hour emission limit not to be exceeded
(j) Assumed emission concentration in the absence of an emission limit and as assumed for normal emissions
(k) Assumed to increase by a factor of 100

For metals other than mercury, it is assumed that these are associated with the particle phase and that the emission will increase at the same rate as the total dust emission (i.e. by a factor of 5 = 150/30). For mercury, it is assumed that the abnormal emission concentration is 100 times the emission limit. Therefore, short-term emission concentrations for trace metals are provided in **Table 5.25.**

Table 5.25: Short-term Abnormal Emission Concentrations – Metals

Metal	Daily ELV (mg/Nm^3)	Hourly Abnormal Emission (mg/Nm^3)	Plausible Abnormal Emission (g/s) (a)
Cd (24-hour mean)	0.02	0.1	0.033
Hg (24-hour mean)	0.02	2	0.35
Hg (1-hour mean)	0.02	2	2
Sb (1-hour mean)	0.3	1.5	1.5
Cr (24-hour mean)	0.3	1.5	0.5
Cu (24-hour mean)	0.3	1.5	0.5
Mn (1-hour mean)	0.3	1.5	1.5
Ni (1-hour mean)	0.3	1.5	1.5
V (24-hour mean)	0.3	1.5	0.5

(a) Abnormal emissions assumed to occur for 4 hours, for the remainder of the averaging period (e.g. for emissions with 24-hour or 8-hour AQAL) emissions are assumed to be at the daily ELV

5.4.5 Abnormal Emissions – Long-term Impacts

For assessing abnormal emissions on long-term concentrations of dioxins and furans and PCBs, it is assumed that complete failure of the abatement equipment occurs for the full 60 hours allowed per annum and that emissions are 100 times the limit for all of these 60 hours. There is no air quality objective (AQO) or environmental assessment level (EAL) for dioxins/furans. Therefore, the impact of abnormal emissions of dioxins/furans is provided in the human health risk assessment and is not considered further here. Assuming that the plant operates at the emission limit (or assumed emission concentration) for 8,700 hours and at 100 times the limit for 60 hours of the year, the emission concentrations for PCBs would be and 0.0084 mg/Nm^3 (0.00043 g/s), respectively.

5.4.6 Results – Short-term Impacts

Maximum predicted concentrations are provided for the relevant averaging period assuming that abnormal emissions occur during the period of worst-case dispersion conditions for the five years of meteorological data in **Table 5.26.** Exceedance of the limit value does not necessarily indicate non-compliance with the AQAL as some of the pollutants considered (e.g. NO_2, SO_2 and PM_{10}) have AQAL where a number of exceedances are allowed. The predicted ground level concentrations have been determined assuming that operating conditions, such as volumetric flow rate and temperature, remain the same.

Table 5.26: Maximum Predicted Short-term Concentrations for Abnormal Emissions

Pollutant	PC (µg/m^3)	PC (%)	PEC (%)
NO_2 (maximum 1-hour)	83.0	41.5%	51.4%
SO_2 (maximum 15-minute)	312	117.2%	120.5%
SO_2 (maximum 1-hour)	233	66.5%	70.7%
SO_2 (maximum 24-hour)	31.4	25.1%	41.2%
PM_{10} (maximum 24-hour)	8.6	17.2%	48.6%
HCl (maximum 1-hour)	414.5	55.3%	55.5%
HF (maximum 1-hour)	69.1	43.2%	43.3%
CO (maximum 8-hour)	27.7	0.3%	2.2%
CO (maximum 1-hour)	47.4	0.2%	1.1%
Pollutant	PC (ng/m^3)	PC (%)	PEC (%)
Cd (24-hour maximum)	9.8	32.7%	33.7%
Hg (24-hour maximum)	**103**	**171.7%**	**177.0%**
Hg (1-hour maximum)	**949**	**158.2%**	**159.1%**
Sb (1-hour maximum)	712	0.5%	0.5%
Cr (24-hour maximum)	147	7.4%	9.3%
Cu (24-hour maximum)	**147**	**294.4%**	**329.1%**
Mn (1-hour maximum)	712	0.5%	0.5%
Ni (1-hour maximum)	**712**	**101.7%**	**105.5%**
V (24-hour maximum)	147	14.7%	14.8%
PCBs (1-hour maximum)	237	4.0%	4.0%

For some pollutants (SO_2, Hg, Cu and Ni), the PC exceeds the respective AQAL. However, these are for the worst-case assumptions adopted for the abnormal emissions assessment. This includes the worst-case meteorological conditions, continuous operation at the abnormal emission level, maximum predicted concentrations anywhere within the model domain and for SO_2, the maximum 15-minute mean concentration (calculated by multiplying the maximum 1-hour mean by a factor of 1.34). Alternative results are provided in **Table 5.27** at locations where there is relevant public exposure. These are for all sensitive receptors for hourly and 8 hour averaging periods and receptors H3 to H16 for 24 hour averaging periods.

Table 5.27: Maximum Predicted Short-term Concentrations for Abnormal Emissions at Sensitive Receptors

Pollutant	PC ($\mu g/m^3$)	PC (%)	PEC (%)
NO_2 (maximum 1-hour)	42.7	21.3%	31.2%
SO_2 (maximum 15-minute)	160	60.2%	63.5%
SO_2 (maximum 1-hour)	120	34.1%	38.4%
SO_2 (maximum 24-hour)	10.6	8.4%	24.5%
PM_{10} (maximum 24-hour)	2.9	5.8%	37.2%
HCl (maximum 1-hour)	213	28.4%	28.7%
HF (maximum 1-hour)	35.5	22.2%	22.3%
CO (maximum 8-hour)	15.2	0.2%	2.0%
CO (maximum 1-hour)	24.4	0.1%	1.0%
Pollutant	**PC (ng/m^3)**	**PC (%)**	**PEC (%)**
Cd (24-hour maximum)	3.3	11.0%	12.0%
Hg (24-hour maximum)	34.6	57.7%	63.0%
Hg (1-hour maximum)	488	81.3%	82.2%
Sb (1-hour maximum)	366	0.2%	0.2%
Cr (24-hour maximum)	49.5	2.5%	4.4%
Cu (24-hour maximum)	**49.5**	**99.0%**	**133.7%**
Mn (1-hour maximum)	366	0.2%	0.3%
Ni (1-hour maximum)	366	52.2%	56.1%
V (24-hour maximum)	49.5	4.9%	5.1%
PCBs (1-hour maximum)	122	2.0%	2.0%

Predicted concentrations as the PC are less than 100% of the AQAL for all pollutants. However, combined with the background concentration, the predicted maximum 24-hour mean Cu concentration as the PEC exceeds the AQAL. The distribution of predicted maximum abnormal 24-hour mean concentrations of Cu as the PC for 2024 (year giving the highest 24-hour mean) is presented in **Figure 5.8.** The red contour line represents the AQAL of 50 ng/m^3.

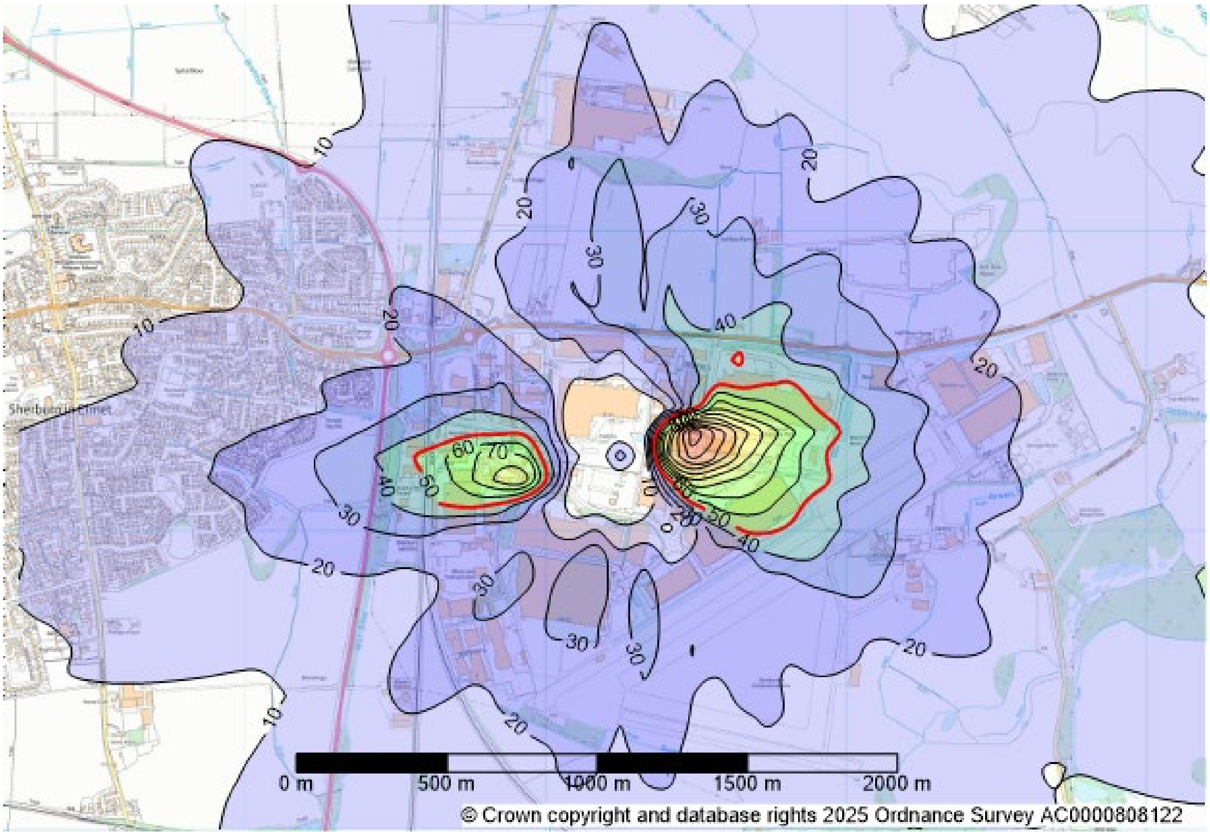


Figure 5.7: Predicted Maximum 24-Hour Mean Abnormal Cu Concentrations 2024 (ng/m³)

Highest sensitive receptor concentrations occur to the north of the facility (Receptor R7). Due to smoothing, the 50 ng/m³ (AQAL) contour does not extend beyond the industrial area. Taking into consideration that this is for a very worst-case with respect to the meteorological conditions for the five years of meteorological data, the assumed continuous operation at abnormal conditions and the adopted worst-case background concentration, it is considered that an actual exceedance would be unlikely. Therefore, it is concluded that abnormal emissions would not result in short-term adverse impacts.

5.4.7 Results – Long-term Impacts

The long-term impact of abnormal emissions of PCBs is summarised in **Table 5.28.** Predicted concentrations are provided for the worst-case meteorological year and the maximum predicted concentration anywhere within the model domain. The predicted ground level concentrations have been determined assuming that operating conditions, such as volumetric flow rate and temperature, remain the same. Predicted concentrations are less than 1% of the relevant AQAL and would be assessed as not significant.

Table 5.28: Predicted Annual Mean Concentrations for Abnormal Emissions

Pollutant	PC (ng/m³)	PC (%)	PEC (%)
PCBs	0.24	0.1%	5.0%

5.5 Sensitivity Analysis

5.5.1 Introduction

For the detailed assessment provided, a conservative approach has been undertaken in order to avoid underestimating the impact of the installation on local air quality. This has included emissions at the maximum permissible, the worst-case meteorological year for each averaging period and continuous operation of the installation at full load. The effect of varying some of these parameters is considered. This sensitivity analysis has been carried out for emissions of NOx as this is considered to be the key pollutant emitted from the installation and has both a long-term and short-term AQAL. Predicted concentrations of NO_2 are provided as the maximum predicted for the annual mean and the 99.8th percentile of hourly means.

5.5.2 Meteorological Data

Dispersion modelling for five years of NWP meteorological data for the specific facility location was undertaken. Results presented in **Section 5.1** are the highest predicted for each averaging period and each receptor. A comparison of predicted concentrations of NO_2 for each of the five years is presented in **Table 5.29** as the maximum predicted anywhere within the modelling domain. In addition, predictions for an alternative observing station at Topcliffe for 2023 are provided. This observing station is located 46 km north of the site but at a comparable elevation.

Table 5.29: Maximum Predicted Concentrations of NO_2 for Annual Meteorological Data Sets

Year	Annual Mean		99.8th Percentile of 1-hour Means	
	PC (µg/m^3)	PC (%age AQAL)	PC (µg/m^3)	PC (ug/m^3)
NWP 2020	2.1	5.2%	17.4	8.7%
NWP 2021	1.4	3.5%	17.8	8.9%
NWP 2022	1.9	4.6%	18.8	9.4%
NWP 2023	2.4	5.9%	18.4	9.2%
NWP 2024	2.1	5.2%	18.5	9.2%
NWP Average	2.0	4.9%	18.2	9.1%
Topcliffe 2023	1.5	3.7%	18.8	9.4%

For the annual mean, predicted concentrations for the five years are quite variable with the lowest concentration (2021) being 58% of the highest concentration (2023). The average for the five years is 2.0 µg/m^3 (83% of the maximum year). The hourly mean concentrations show less variability with the highest concentration (2022) 108% of the lowest concentration (2020). The annual mean concentrations for Topcliffe 2023 are lower than for the NWP 2023 and comparable to the lowest NWP year. Short-term concentrations for Topcliffe are identical to the same NWP year.

5.5.3 Main Building Selection

The nearest buildings to the stack are the Flue Gas Treatment (FGT) building and the Air Cooled Condensers (ACC). However, although further away from the stack, the Steam Generator (SG) building is significantly bigger than the FGT building or the ACC. Therefore, the SG was selected as the main building for the assessment. A sensitivity analysis was undertaken with each of these three buildings selected as the main building. Results for 2023 are presented in **Table 5.30.**

Table 5.30: Predicted Maximum NO_2 Concentrations for Variable Main Buildings

Main Building	Annual Mean		99.8th Percentile of 1-hour Means	
	PC (µg/m^3)	PC (%age AQAL)	PC (µg/m^3)	PC (ug/m^3)
Air Cooled Condensers 2023	0.67	1.7%	6.7	3.4%
Flue Gas Treatment 2023	0.67	1.7%	6.7	3.4%
Steam Generator 2023	2.4	5.9%	18.4	9.2%

The use of SG as the main building results in substantially higher concentrations compared to the ACC and FGT buildings and is representative of the worst-case.

5.5.4 Surface Roughness

The assessment provided assumes that the surface roughness surrounding the facility is 0.5 m mainly due to the immediate industrial surroundings but the rural setting beyond the industrial units. The effect of varying the surface roughness is provided in **Table 5.31** for a lower surface roughness of 0.3 m and a higher surface roughness of 0.7 m.

Table 5.31: Predicted Maximum NO_2 Concentrations for Variable Surface Roughness Values

Surface Roughness	Annual Mean		99.8th Percentile of 1-hour Means	
	PC (µg/m^3)	PC (%age AQAL)	PC (µg/m^3)	PC (ug/m^3)
Surface roughness of 0.3 m 2023	2.2	5.6%	19.4	9.7%
Surface roughness of 0.5 m 2023	2.4	5.9%	18.4	9.2%
Surface roughness of 0.7 m 2023	2.5	6.2%	18.0	9.0%

The use of the higher surface roughness in the model results in a small increase in the maximum predicted annual mean concentration and a small decrease in the short-term concentration. For lower surface roughness, the reverse is true. Therefore, overall, varying the surface roughness does not significantly affect predicted concentrations.

5.5.5 Summary

The sensitivity analysis has demonstrated that varying the assumptions made for the assessment does vary the predicted concentrations for most choices. However, except for surface roughness (where differences are small), the analysis has demonstrated that the worst-case assumptions have been adopted for the assessment. Therefore, it is concluded that overall the assessment provided is robust and representative of worst-case conditions.

6. CONCLUSION

An assessment is provided of the likely local air quality impacts arising from emissions to air from an Energy from Waste facility at Aviation Road, Sherburn in Elmet, Leeds, LS25 6NF. The purpose of the assessment is to support an Environmental Permit application for the facility.

Detailed air quality modelling using the ADMS dispersion model has been undertaken to predict the impacts associated with the emissions from the facility. There would be a single emission to air from the facility via a 50 m stack. Emissions from the EFW facility will be governed by the Industrial Emissions Directive (IED) and as a new plant will be required to comply with the BAT AELs specified in the BREF.

For a stack height of 50 m, predicted maximum off-site concentrations are well below the relevant air quality standards for all pollutants considered.

The predicted process contributions are negligible compared with the critical levels for airborne NOx, SO_2, NH_3 and HF and critical loads for nutrient nitrogen deposition and acidification at nearby sensitive habitat sites.

APPENDIX A AIR QUALITY STANDARDS AND OBJECTIVES

Table A 1: Air Quality Standards and Objectives

Pollutant	Averaging Period	EAL / AQAL ($\mu g/m^3$)	Comments
Nitrogen dioxide (NO_2)	annual	40	UK AQO and EU Limit Value
	1-hour	200	UK AQO and EU Limit Value, not to be exceeded more than 18 times per annum, equivalent to the 99.8th percentile of 1-hour means
Sulphur dioxide (SO_2)	24-hour	125	UK AQO and EU Limit Value, not to be exceeded more than 3 times per annum, equivalent to the 99.2nd percentile of 24-hour means
	1-hour	350	UK AQO and EU Limit Value, not to be exceeded more than 24 times per annum, equivalent to the 99.7th percentile of 1-hour means
	15-minute	266	UK AQO, not to be exceeded more than 35 times per annum, equivalent to the 99.9th percentile of 15-minute means
Carbon monoxide (CO)	8-hour	10,000	UK AQO and EU Limit Value
	1-hour	30,000	EAL
Particulate matter (as PM_{10})	annual	40	UK AQO and EU Limit Value
	24-hour	50	UK AQO and EU Limit Value, not to be exceeded more than 35 times per annum, equivalent to the 90.4th percentile of 24 hour means
Particulate matter (as $PM_{2.5}$)	annual	20	EU Target Value
Total organic carbon (benzene)	annual	5	AQO (England and Wales)
	24-hour	30	EAL
Hydrogen chloride (HCl)	1-hour	750	EAL
Hydrogen fluoride (HF)	1 hour	160	EAL
	monthly	16	EAL
Antimony (Sb)	annual	5	EAL
	1-hour	150	EAL
Arsenic (As)	annual	0.006	EU Target Value
Cadmium (Cd)	annual	0.005	EU Target Value
	24-hour (short term)	0.03	EAL
Chromium III (CrIII)	24-hour (long term)	2.0	EAL
Chromium VI (CrVI)	annual	0.00025	EAL
Cobalt (Co)	annual	1	Derived from HSE EH40/2002 OEL
Copper (Cu)	24-hour (long term)	0.05	EAL
Manganese (Mn)	annual	0.15	EAL
	1-hour	1,500	EAL
Lead (Pb)	annual	0.25	UK AQO
Mercury (Hg)	24-hour (long term)	0.06	EAL

	1-hour	0.6	EAL
Nickel (Ni)	annual	0.02	EU Target Value
	1-hour	0.7	EAL
Thallium (Tl)	annual	1	Derived from HSE EH40/2002 OEL
Vanadium (V)	24-hour	1	WHO
Polycyclic Aromatic Hydrocarbons (PAH) as Benzo[a]Pyrene	annual	0.00025	UK AQO
Polychlorinated Biphenyls (PCBs)	annual	0.2	EAL
	1-hour	6	EAL

APPENDIX B DISPERSION MODEL INPUT PARAMETERS

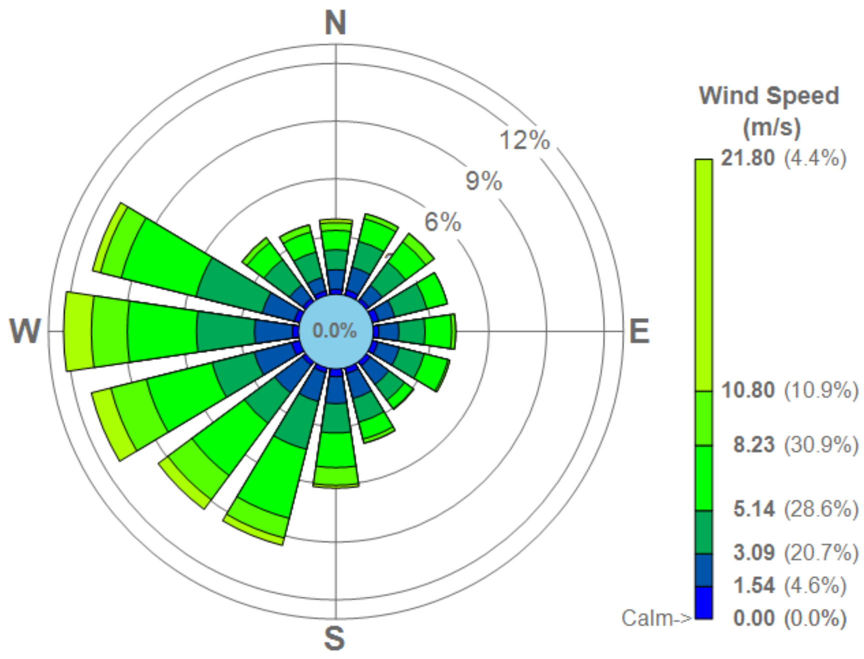
Table B 1: Emission Parameters for the EFW Facility

Parameter	Value
Stack height (m)	50
Flue exit diameter (m)	2.0
Temperature of release (ºC)	190
Actual flow rate (Am^3/s)	77.6
Moisture content (%v/v)	14.5
Oxygen content (%v/v dry)	8.0
Normalised flow rate (Nm^3/s)	51.0 (a)
Emission velocity at flue exit (m/s)	24.7
Emission Concentration (mg/Nm^3) (a)	**ELV**
PM_{10}	5
TOC	10
HCl	6
HF	1
CO	50
SO_2	30
NOx	120
Group I (Cd, Tl)	0.02
Group II (Hg)	0.02
Group III (Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V)	0.3
Dioxins and Furans	6.0×10^{-8}
PAHs (as B[a]P)	9.0×10^{-5}
PCBs	5.0×10^{-3}
NH_3	10

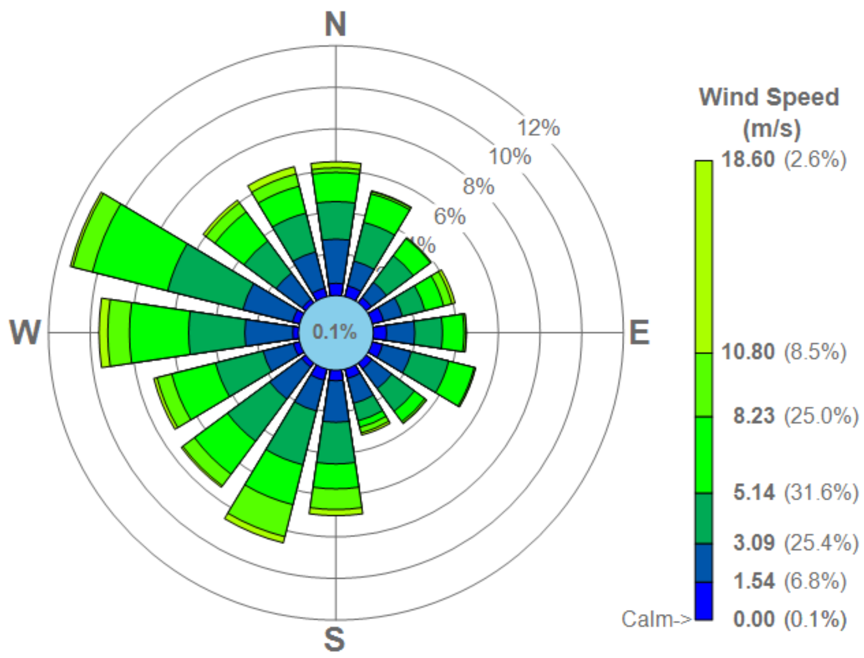
(a) At 11% O_2 273K, 101.3 kPa, dry

APPENDIX C WIND ROSES – NWP DATA

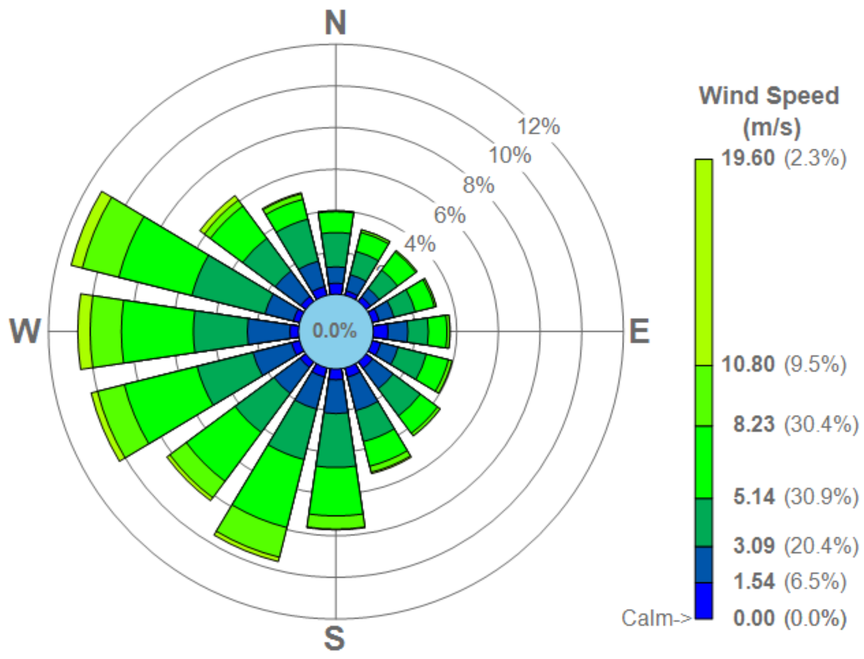
2020


N
E
S
W
6%
9%
12%
0.0%
Wind Speed (m/s)
21.80 (4.4%)
10.80 (10.9%)
8.23 (30.9%)
5.14 (28.6%)
3.09 (20.7%)
1.54 (4.6%)
Calm-> 0.00 (0.0%)

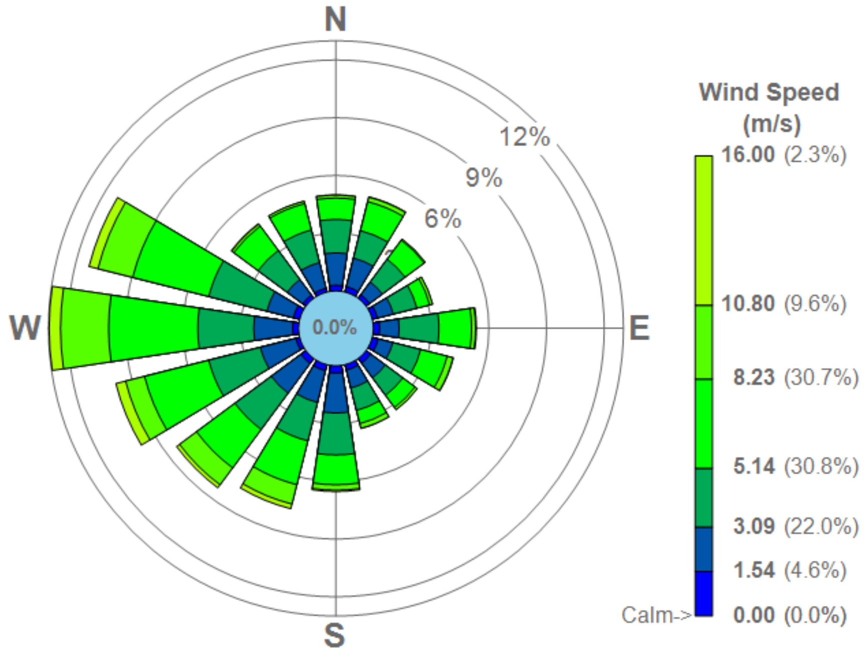
2021


N
E
S
W
6%
8%
10%
12%
0.1%
Wind Speed (m/s)
18.60 (2.6%)
10.80 (8.5%)
8.23 (25.0%)
5.14 (31.6%)
3.09 (25.4%)
1.54 (6.8%)
Calm-> 0.00 (0.1%)

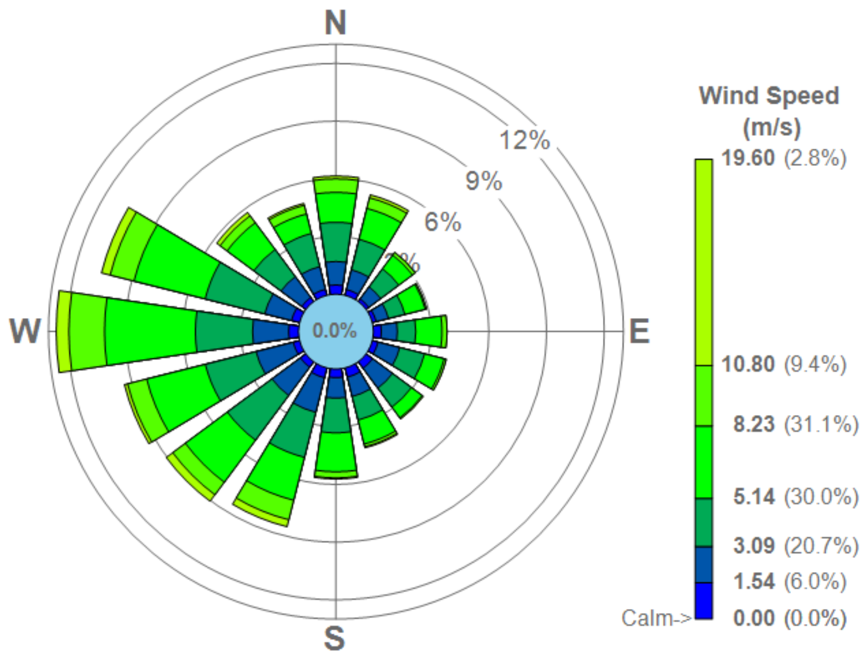
2022


N
E
S
W
12%
10%
8%
6%
4%
0.0%
Wind Speed (m/s)
19.60 (2.3%)
10.80 (9.5%)
8.23 (30.4%)
5.14 (30.9%)
3.09 (20.4%)
1.54 (6.5%)
Calm->
0.00 (0.0%)

2023


N
E
S
W
12%
9%
6%
0.0%
Wind Speed (m/s)
16.00 (2.3%)
10.80 (9.6%)
8.23 (30.7%)
5.14 (30.8%)
3.09 (22.0%)
1.54 (4.6%)
Calm->
0.00 (0.0%)

2024


N
E
S
W
12%
9%
6%
3%
0.0%
Wind Speed
(m/s)
19.60 (2.8%)
10.80 (9.4%)
8.23 (31.1%)
5.14 (30.0%)
3.09 (20.7%)
1.54 (6.0%)
Calm->
0.00 (0.0%)

APPENDIX D ENVIRONMENTAL ASSESSMENT LEVELS FOR THE PROTECTION OF VEGETATION AND ECOSYSTEMS

Critical Levels

Critical levels are thresholds of airborne pollutant concentrations above which damage may be sustained to sensitive plants and animals.

The critical levels for the protection of vegetation and ecosystems (as defined by the EU Directive 2008/50/EC and the 2010 UK Air Quality Standards Regulations) that are relevant to the assessment are summarised in Table D1.

Table D 1: Levels for the Protection of Vegetation and Ecosystems

Pollutant	Averaging Period	Concentration (μg/m^3)
Oxides of Nitrogen (NOx)	Annual Mean	30
	24-Hour Mean	75
Sulphur Dioxide (SO_2)	Annual Mean / Winter Mean (31 Oct to 1 Mar)	10 (sensitive habitats with lichen and bryophytes)
		20 (all other habitats)
Ammonia (NH_3)	Annual Mean	1 (sensitive habitats with lichen and bryophytes)
	Annual Mean	3 (all other habitats)
Hydrogen Fluoride (HF)	Weekly Mean	0.5
	Daily Mean	5

Critical Loads

Critical loads refer to the threshold beyond which deposition of pollutants to water or land results in measurable damage to vegetation and habitats. This takes the form of either gravitational settling of particulate matter (dry deposition) or wet deposition, where atmospheric pollutants dissolve in water vapour and then precipitate to the ground (e.g. as rain, snow, fog etc.).

Critical loads for eutrophication (nutrient nitrogen deposition) and background nutrient nitrogen deposition rates have been obtained from the Air Pollution Information System (APIS) and are summarised in Table D2 for the identified habitat sites. It is assumed that both LWS comprise neutral grassland.

Table D 2: Critical Loads (Eutrophication) and Background Nutrient Nitrogen Deposition

Habitat Site	Primary Sensitive Habitat	Critical Load (kg N/ha/a)	Background N Deposition (kg N/ha/a)
H1 Pasture Opposite Gypsum Works LWS	Neutral grassland	10	14.13
H2 Ash Tree Dike and Ponds LWS	Neutral grassland	10	14.01

The background nutrient nitrogen deposition rate exceeds the upper critical load at all of the identified habitat sites.

For acidic deposition, the critical load of a habitat site is largely determined by the underlying geology and soils. The critical load of acidification is defined by a critical load function (CLF) which describes the relationship between the relative contributions of sulphur (S) and nitrogen (N) to the total acidification.

The critical load function is defined by the following parameters:

- CLmaxS, the maximum critical load of acidity for S, assuming there is no N deposition;
- CLminN, is the critical load of acidity due to nitrogen removal processes in the soil only (i.e. independent of deposition); and
- CLmaxN, is the maximum critical load of acidity for N, assuming there is no S deposition.

The critical loads for acidification for the local habitat sites are presented in Table D3. It is assumed that both LWS comprise neutral grassland.

Table D 3: Critical Loads (Acidification) and Background Nitrogen and Sulphur Acidification Rates

Habitat Site	Primary Sensitive Habitat	Critical Load (keq/ha/a)			Background Acidification (keq/ha/a)
		Max S	Min N	Max N	
H1 Pasture Opposite Gypsum Works LWS	Neutral grassland	4.0	1.071	5.071	1.06
H2 Ash Tree Dike and Ponds LWS	Neutral grassland	4.0	1.071	5.071	1.05