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Environmental Permit Variation and Partial Low Risk Surrender Application
North Killingholme Power Project

Appendix F - Air Quality Impact Assessment

Reference: KLCP-ARP-EN-ACB010-0004

P02 | 9 February 2026

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List of Abbreviations

ADMS	Atmospheric Dispersion Modelling System
APIS	Air Pollution Information Service
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Standard
BAT	Best Available Techniques
BAT-AEELs	Best Available Techniques-Associated Energy Efficiency Levels
BAT-AELs	Best Available Techniques -Achievable Emission Levels
BATc	Best Available Techniques Conclusions document
BRef	BAT Reference document
CCGT	Combined Cycle Gas Turbine
CL	Critical Level
CLd	Critical Load
CLRTAP	Convention on Long-range Transboundary Air Pollution
CO	Carbon Monoxide
EA	Environment Agency
EAL	Environmental Assessment Level
EP	Environmental Permit
HVAC	Heating, Ventilation and Air Conditioning
IED	Industrial Emissions Directive
JT	Joules Thomson
LCP	Large Combustion Plant
LWS	Local Wildlife Site
MWe	Megawatt electrical
MWth	Megawatt thermal
NELC	Northeast Lincolnshire Council
NLC	North Lincolnshire Council
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PC	Process Contribution
PCM	Pollution Climate Mapping
PEC	Predicted Environmental Concentration
SAC	Special Area of Conservation
SCAIL	Simple Calculation of Atmospheric Impact Limits

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SCR	Selective Catalytic Reduction
SO$_2$	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UNECE	United Nations Economic Commission for Europe

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1.   Introduction

This Appendix has been prepared in support of the Environmental Permit variation application for the proposed North Killingholme Power Project (the 'Installation') to be located in Killingholme, North Lincolnshire.

The Installation was permitted in 2017 to enable the operation of a Combined Cycle Gas Turbine (CCGT) with a net output of 470 MWe, however, the CCGT has not yet been constructed. Uniper are now looking to construct the CCGT, which would have a grid connection capacity of a net output of 540 MWe and therefore will be larger than the currently permitted plant. As such, a new Air Impact Assessment has been carried out to support the Environmental Permit variation application that is being submitted to increase the capacity of the CCGT plant.

The purpose of this Appendix is to detail the Air Quality Impact Assessment that has been carried out for the Installation and to demonstrate that the emissions from the Installation would not lead to the exceedance of any Air Quality Standards (AQS) objectives, Environmental Assessment Levels (EALs), Critical Levels (CLs) and Critical Loads (CLds), as appropriate.

The pollutants included in the assessment are oxides of nitrogen (NO_x), nitrogen dioxide (NO_2) and carbon monoxide (CO).

In addition to the CCGT, there will be an auxiliary boiler, to provide steam to the HRSG on start-up, two Joules Thomson (JT) heaters to counter the cooling effect of gas depressurisation and an emergency diesel generator (EDG) to provide a short-term source of electricity, in the event of a simultaneous loss of power generation and external power supply.

Consideration of the impacts associated with the auxiliary boiler, JT heaters and the intermittent testing of the EDG are also included in the assessment. The EDG is required to meet the 72-hour resilience requirement in the Grid Code, to ensure that power can be restored to the National Electricity Transmission System (NETS) in the event of a total or partial shut-down, and therefore to ensure it remains fit-for-purpose it will require regular testing. An indicative testing scenario of 12 hours per year and an emergency scenario of 72 hours per year have been assessed.

The assessment includes:

- A summary of the air quality standards and guidance that are applicable;

- Existing background air quality data;

- An outline of the assessment methodology;

- A detailed dispersion modelling assessment of the operation of the Installation including the CCGT, the auxiliary boiler and the JT gas heaters;

- a Simple Calculation of Atmospheric Impact Limits (SCAIL) assessment of the operation of the EDG.

The assessment has been carried out in accordance with the Environment Agency's (EA) Risk Assessments for Specific Activities: Environmental Permits guidance (Defra and EA, 2016)[1] (EA's Risk Assessment Guidance).

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[1] Environment Agency, 2025. Air emissions risk assessment for your environmental permit. Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit [Accessed September 2025]

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2. Assessment Criteria

2.1 Air Quality Legislation

The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010[2] (amended 2016), which transposes the requirements of the European Ambient Air Quality Directive 2008[3] and the 2004 fourth Air Quality Daughter Directive[4]. The Air Quality Standards Regulations 2010 set air quality limits for a number of major air pollutants that have the potential to impact public health or the natural environment, such as nitrogen dioxide (NO_2), carbon monoxide (CO) and oxides of nitrogen (NOx).

The Environment Act 2021[5] amended the Environment Act 1995, which requires the UK Government to produce a National Air Quality Strategy (AQS)[6], last reviewed in 2007, containing air quality objectives and timescales to meet those objectives. The AQS objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor or in-vehicle exposure.

Some pollutants have objectives expressed as annual average concentrations due to the chronic way in which they affect health or the natural environment, i.e., effects occur after a prolonged period of exposure to elevated concentrations. Other pollutants have objectives expressed as 24-hour or 1-hour average concentrations due to the acute way in which they affect health or the natural environment, i.e., after a relatively short period of exposure. Some pollutants have objectives expressed in terms of both long and short-term concentrations.

The current AQS objectives applicable to this assessment for the protection of human health are presented in Table 2-1.

Table 2-1: Air Quality Strategy (AQS) Objectives – Protection of Human Health

Pollutant	AQS Objective (µg/m³)	Averaging Period
Nitrogen dioxide (NO_2)	40	Annual mean
	200	1-hour mean, not to be exceeded more than 18 times a year (99.79th percentile)
Carbon monoxide (CO)	10,000	Maximum daily running 8-hour mean

The impacts of emissions from the Installation on sensitive ecological receptors are quantified within this assessment in two ways:

- as direct impacts on plants physiology, growth and vitality arising due to increases in atmospheric pollutant concentrations, assessed against defined 'Critical Levels'; and

- as indirect impacts arising through deposition of acids and nutrient nitrogen to the ground surface, assessed against defined 'Critical Loads'.

Critical Levels (CLs) for the protection of vegetation and ecosystems have been adopted by, amongst others, the European Union and the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (CLRTAP).

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[2] The Air Quality Standards Regulations 2010 (SI 2010/1001). London: The Stationery Office.

[3] European Commission (2008) European Directive on Ambient Air Quality 2008/50/EC.

[4] European Commission (2004) European Fourth Daughter Directive on Ambient Air Quality. 2004/107/EC.

[5] The Environment Act 2021 (c. 30). Available online: Environment Act 2021 (legislation.gov.uk)

[6] Department for Environment, Food and Rural Affairs (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. London: The Stationery Office.

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Under the European Ambient Air Quality Directive, assessment of compliance with CLs is strictly only required at locations more than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas, industrial installations or motorways. However, in practice, and in line with the EA's Risk Assessment Guidance[1], assessment against CLs is undertaken at all ecological sites, regardless of this definition.

The annual average CL for NOx has been transposed in the Air Quality Standards Regulations 2010. Additional values for daily NOx are also generally used as regulatory standards, although these have not been formally adopted. The CLs applicable to this assessment for the protection of vegetation and ecosystems are presented in Table 2-2.

Table 2-2: Critical Levels – Protection of Vegetation and Ecosystems

Pollutant	Critical Level ($\mu g/m^3$)	Averaging Period	Other Information
Oxides of nitrogen (NOx)	30	Annual mean	-
	75	Daily mean	The critical level is generally considered to be 75 $\mu g/m^3$, but this only applies where there are high concentrations of SO_2 and ozone, which is not generally the current situation in the UK. Given the low UK SO_2 concentrations IAQM consider the higher value of 200 $\mu g/m^3$ can be used as a short-term CL.[7]

Critical Loads (CLds) for the deposition of nutrient nitrogen and acidifying species are dependent on the habitat type and species present and therefore are specific to habitat types considered within the assessment. The relevant CLds for the habitats present within the identified ecological receptors considered in this assessment are defined on the Centre for Ecology and Hydrology Air Pollution Information System (APIS) website[8] and are detailed in Section 4.4.

CLds are provided as ranges of kilograms of nitrogen per hectare per year (kg N/ha/yr) or acid kilogram equivalents (keq/ha/yr) for nitrogen and acid deposition respectively, which reflect the variation in ecosystem response across Europe. To ensure that a conservative assessment is carried out, it is usual for impacts to be determined against the lower end (i.e. the most stringent) of the CLd range.

2.2 Environmental Permitting Regulations

2.2.1 Industrial Emissions Directive

The EU's Industrial Emissions Directive (IED)[9] provides operational limits and controls to which plant must comply, including Emission Limit Values (ELVs) for pollutant releases to air. The CCGT of the Installation falls under the Large Combustion Plant (LCP) requirements (Chapter III) of the IED, since it will be greater than 50 MW thermal input capacity.

The operator of a plant covered by the IED is required to employ Best Available Techniques (BAT) for the prevention or minimisation of emissions to the environment, to ensure a high level of protection of the environment as a whole. European BAT reference documents (BRefs) are published for each industrial sector regulated under the IED, and they include BAT-Achievable Emission Levels (AELs), which are expected to be met through the application of BAT. These levels may be the same as the ELVs published in the IED, or they may be more stringent. The current version of the LCP BRef and associated BAT Conclusions (BATc) relevant in the UK includes daily average and yearly average BAT-AELs for natural gas fired CCGT plant for NOx and indicative values for yearly average carbon monoxide CO, which are more stringent than the ELVs

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[7] IAQM, 2020. A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites.

[8] CEH, 2025. Air Pollution Information System (APIS). Available at: www.apis.ac.uk [Accessed August 2025]

[9] 'Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevance' (2010). *Official Journal* L334, P.17.

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included in the IED. In the UK, IED has been implemented through the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EP Regulations).

Where legislative ambient AQS are not specified for the pollutant species potentially released from an installation, Environmental Assessment Levels (EALs), published in the EA's Risk Assessment Guidance can be used to assess potential health effects on the general population. For this assessment this includes an additional EAL for hourly concentrations of CO.

Table 2-3: Environmental Assessment Levels

Pollutant	EAL ($\mu g/m^3$)	Averaging Period
Carbon monoxide (CO)	30,000	Hourly mean as 100th percentile

2.3   Human Health Significance Criteria

The EA's Risk Assessment Guidance[1] identifies a two-stage process for determining the impact of emissions to air from a process. The stage one screening criteria compares the process contribution (PC) (i.e. the modelled ground level pollutant concentration) with the relevant AQS objective or EAL. The criteria states that an emission may be considered to have an insignificant impact where:

- Short term PC <=10% of the AQS objective or EAL; and,

- Long term PC <=1% of the AQS objective or EAL.

If both criteria are met, no further assessment is required, but if they are not met, the second stage of screening is applied.

The second stage of screening considers the PCs in the context of the existing background pollutant concentrations; the predicted environmental concentration (PEC) (i.e. the PC plus the background concentration) is considered acceptable where:

- Short term PC <20% of the short term AQS objective or EAL minus twice the long-term background concentration (headroom); and

- Long term PEC (PC + background concentration) <70% of the AQS objective or EAL.

The EA's Risk Assessment Guidance indicates that where AQS objective or EAL are likely to be breached as a result of contributions from an installation, or where installation releases constitute a major proportion of the AQS or EAL, such releases are likely to be considered unacceptable.

Where the PEC is not predicted to exceed the AQS objective or EAL and the proposed emissions comply with the BAT-AEL (or equivalent requirements) the emissions may be considered acceptable by the EA.

2.4   Ecological Significance Criteria

For European sites (Special Protection Areas (SPA), Special Areas of Conservation (SAC) or Ramsar sites) an assessment is made as to whether the emissions from an installation are 'likely to have a significant effect', and whether this could lead to an 'adverse effect on site integrity'. Sites within 15 km have been considered in the assessment, which has also included Sites of Special Scientific Interest (SSSIs).

The EA's Risk Assessment Guidance states that PCs may be considered to have an insignificant impact at the first stage of screening on these sites where:

- Short term PC <=10% of the CL; and,

- Long term PC <=1% of the CL.

If these requirements are not met for short term impacts, further assessment is required. For long term impacts, the PEC must be calculated and if it is less than 70% of the CL, the impacts are considered insignificant.

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For SPAs, SACs and Ramsar sites, there is also a requirement to consider the 'in combination' (combined) impact of all permissions, plans or projects that affect the site.

For local nature sites, the assessment needs to determine whether the emissions are 'likely to damage' the site and is applicable to sites within 2 km of the Installation. The EA's Risk Assessment Guidance screening criteria states that where PCs are less than 100% of the short or long term CL, the impact of emissions is insignificant at these sites.

The impact of point source emissions on ecological receptors, through deposition of nutrient nitrogen or acidity, has been evaluated using the EA's Risk Assessment guidance insignificance criterion of 1% of CLd. However, it should be noted that impacts over the insignificance criterion of 1% are not consequentially significant, rather an indicator that further consideration of the impacts are required.

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3. Assessment Methodology

3.1 Introduction

The EA's Risk Assessment Guidance[1] provides guidance on the assessment of BAT and of impacts from permitted installations, for the purposes of Environmental Permitting. The guidance also includes the consideration of risk and environmental impacts from other emissions from an installation, including visible plumes.

Emissions from the Installation have been assessed using the EA's Risk Assessment methodology in order to identify where emissions can be screened as having an insignificant impact. Detailed dispersion modelling using the atmospheric dispersion model ADMS 6 has been used to calculate the concentrations of pollutants at identified receptors. These concentrations have been compared with the AQS objectives, EALs and CLs for each pollutant species that could be released from the Installation. Dispersion modelling calculates the predicted concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. This model has been developed for UK regulatory use.

Emissions of sulphur dioxide (SO_2) and particulates (PM_{10} and $PM_{2.5}$) from natural gas fired plant are at such low levels relative to the AQS objectives that they are considered negligible and so the risk to the achievement of the relevant AQS objectives is considered negligible, therefore these have not been considered in the assessment.

It should be noted that Selective Catalytic Reduction (SCR) is not required to achieve the BAT-EALs, as detailed in the Main Supporting Document, and therefore no emissions of ammonia have been modelled.

An assessment of nutrient nitrogen and acidification has been undertaken by applying published deposition velocities (detailed in Section 3.3) to the predicted annual average NO_2 concentrations at the identified statutory habitat sites, determined through dispersion modelling, to calculate nitrogen deposition rates.

These deposition rates have then been compared to the CLds for nitrogen published by APIS for the species present at each habitat site, taking into consideration the baseline air quality.

Increases in acidity from deposition contributions of NO_2 from the process contribution have also been considered. The nitrogen keq/ha/yr, have been derived from nitrogen deposition modelling values using standard conversion factors. The acidity deposition rates and baseline deposition rates have been used within the CLd Function Tool (APIS) to determine whether the contribution would result in exceedance of the defined acidity CLds for the most sensitive feature.

The assessment of worst-case long-term and short-term emissions resulting from operation of the Installation has been undertaken assuming that the CCGT plant is operational, at full load, for 8,760 hours per year, as this represents the worst case for annual average impacts and predicts the maximum short-term impacts from the worst-case meteorological data.

3.2 NO$_x$ to NO$_2$ Conversion

Emissions of NO_x from industrial point sources are typically dominated by nitric oxide (NO), with emissions from combustion sources typically in the ratio of NO to NO_2 of 9:1. However, it is NO_2 that has specified AQS objective due to its potential impact on human health. In the ambient air, NO is oxidised to NO_2 by the ozone present, and the rate of oxidation is dependent on the relative concentrations of NO and ozone in the ambient air.

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For the purposes of detailed modelling, and in accordance with EA technical guidance[10] it is assumed that 70% of emitted NO is oxidised to NO_2 in the long term and 35% of the emitted NO is oxidised to NO_2 in the local vicinity of the Installation in the short-term.

3.3 Deposition Conversion Factors

The dry deposition flux for each receptor has been calculated based on recommended deposition velocities[11], presented in Table 3-1.

Table 3-1: Deposition Velocities

Parameter	Habitat type	Deposition velocity (m/s)
Nitrogen Dioxide (NO_2)	Grassland	0.0015
	Forest	0.003

For nitrogen deposition conversion factors are used to convert dry deposition flux from units of $\mu g/m^2/s$ to kg/ha/yr are shown in Table 3-2.

Table 3-2: Factors to Convert Deposition to kg/ha/yr and to keq/ha/yr

Parameter	Conversion	Factor
Nitrogen Dioxide (NO_2)	$\mu g/m^2/s$ N to kg/ha/yr	96
	kg of N to keq/ha/yr	0.071428

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[10] https://webarchive.nationalarchives.gov.uk/20140328232919/http://www.environment-agency.gov.uk/static/documents/Conversion_ratios_for__NOx_and_NO2_.pdf

[11] Institute of Air Quality Management (IAQM) (2020) A guide to the assessment of air quality impacts on designated nature conservation sites.

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4. Receptors and Baseline Air Quality

4.1 Human Health Receptors

Receptors potentially affected by the emissions from the Installation, including local residential and amenity receptors, have been identified through site knowledge and desk study of local mapping. Isopleth figures of pollutant dispersion have been examined to identify the receptors that will receive the highest point source contributions and these receptors have been included in the model set up as discrete receptors.

The long-term annual mean standard applies at locations where sensitive receptors are located, these include residential properties, hospitals and schools. The short-term hourly mean standard applies at locations where members of the public may be expected to be present for more than an hour.

Human health receptors have been included in the model at a height of 1.5 m, corresponding to the average height of human exposure through breathing.

Individual receptor locations used in the model are shown in Table 4-1 and their locations in Figure 1.

Table 4-1: Identified Human Health Receptors

Receptor I.D.	Receptor Descriptor	Grid reference		Distance and direction from Installation
		x	y	
R1	Residential	514761	417335	2.5km south-west
R2	Residential	514451	417646	2.3km south-west
R3	Residential	514433	418197	1.9km south-west
R4	Residential	514640	418825	1.3km south-west
R5	Residential	513664	419614	2.0km west
R6	Residential	514075	420602	1.7km north-west
R7	School	514923	416108	3.6km south-west
R8	Residential	517155	414968	4.9km south
R9	Residential	517848	415385	4.9km south-east
R10	School	518018	414928	5.3km south-east
R11	School	518584	414754	5.6km south-east
R12	School	518390	414644	5.6km south-east
R13	Residential	515504	416121	3.6km south-west
R14	Residential	515951	415723	3.9km south
R15	Residential	519920	423664	5.6km north-east
R16	Residential	521324	422416	6.1km north-east
R17	Residential	523160	420394	7.3km east

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Figure 1: Human Health Receptor Locations

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4.2 Ecological Receptors

Ecological receptors potentially affected by the operation of the Installation have been identified through a desk study of Defra Magic mapping and the APIS website. Statutory designated sites (including SPAs, SACs, Ramsar sites and SSSIs up to 15 km have been included in the assessment; and non-statutory designations such as Local Wildlife Sites (LWS) within 2km have been included in the assessment. Identified receptors are detailed in Table 4-2 and their locations are shown in Figure 2.

Table 4-2: Identified Ecological Receptors

Receptor ID	Receptor Descriptor	Designation	Grid reference x	Grid reference y	Distance and direction from Installation
E1	Humber Estuary	SPA, Ramsar and SSSI	516258	419728	315m east
	North Killingholme Haven Pits	SSSI			
	Halton Marsh Clay Pits	LWS			
E2	Humber Estuary	SAC	516533	420007	700m north-east
E3	Swallow Wold	SSSI	516925	404973	14.5km south
E4	Wrawby Moor	SSSI	503284	411173	14.9km south-west
E5	Humber Estuary	SPA, Ramsar, SSSI	507196	423932	9.4km north-west
E6	Burkinshaw's Covert	LWS	515627	418817	630m south
E7	Burkinshaw's Covert	LWS	516293	418355	1.2km south-east
E8	Chase Hill Wood	LWS	515692	418867	630m south
E9	Chase Hill Wood	LWS	515513	419264	280m south-west
E10	Scrub Lane Field	LWS	514404	419047	1.3km west
E11	Swinster Lane Field	LWS	514322	419341	1.3km west
E12	East View Meadow	LWS	513862	419977	1.7km north-west
E13	Halton Marsh Clay Pits	LWS	515487	420700	930m north
E14	Humber Estuary – SPA salt meadow habitat	SPA & Ramsar, SSSI, LWS	516786	419926	900m east

In addition, there are four further SSSIs within 15 km of the Installation (Kirmington Pits, Kelsey Gravel Pits, Roos Bog and South Ferriby Chalk Pit), which are designated due to their geological features. It is therefore considered that these sites will not be affected by emissions from the Installation, as the CLs and CLds assigned to such sites are for the protection of vegetation and ecosystems only, and therefore they have been screened out from further assessment.

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Figure 2: Ecological Receptor Locations

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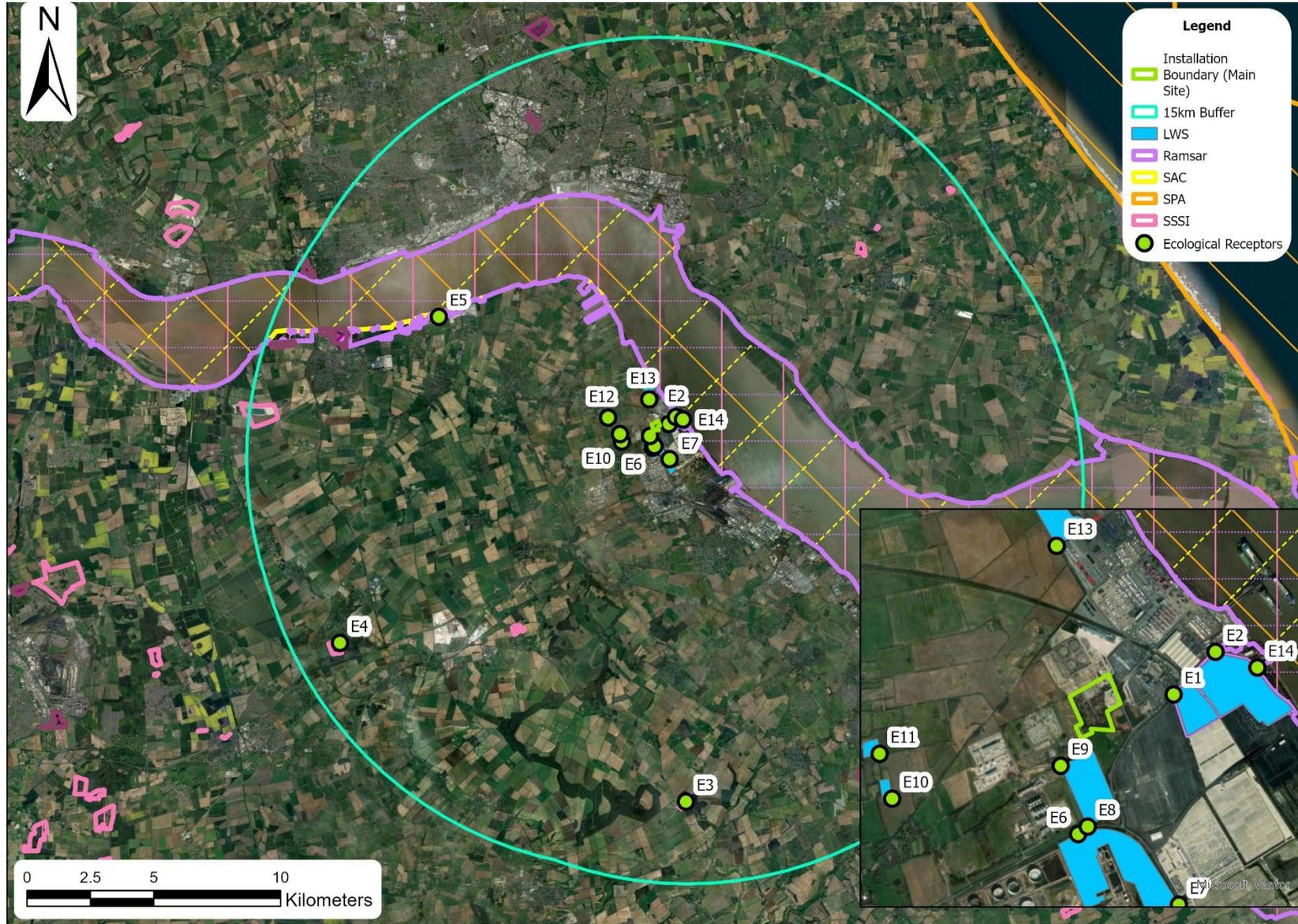
4.3   Human Health Baseline

4.3.1   Local Air Quality

The Environment Act 2021[5] requires local authorities to undertake an assessment of local air quality to establish whether the objectives are being achieved, and to designate air quality management areas (AQMA) if improvements are necessary to meet the objectives. Where an AQMA has been designated, the local authority must draw up an air quality action plan (AQAP) describing the measures that will be put in place to assist in achieving the objectives. Defra has responsibility for coordinating assessments and AQAPs for the UK as a whole.

The Installation is not within an AQMA, and there are no AQMAs within 2km according to the Defra website[12]. The only AQMA in the administrative boundary of North Lincolnshire Council (NLC) is situated approximately 22km south-west of the Installation in Scunthorpe, which was declared in 2005 for exceedances of the daily mean PM_{10} AQS objective.

The closest AQMA to the Installation is situated within the neighbouring Kingston-Upon-Hull City Council authority area approximately 10km north-west of the Installation, which was declared in 2005 for exceedances of the annual mean NO_2 AQS objective.

Given the distances of these AQMAs from the Installation, it is not considered that they would be impacted by the Installation.

4.3.2   Local Monitoring Data

This section presents data for the local air quality monitoring within 2km of the Installation. NLC undertake both continuous and passive monitoring of air quality. The Installation lies within NLC, so monitoring data from this council has been reviewed. The latest year of published monitoring data of 2023 is presented in this section and is taken from the Annual Status Reports[13].

Although the 2020 and 2021 monitoring results are presented, these are not considered to be representative of typical annual mean concentrations due to the Covid-19 pandemic, however, they are included for completeness.

Automatic monitoring

Automatic monitoring involves drawing air continuously through an analyser to obtain near real-time pollutant concentration data. There are six automatic monitoring sites within the NLC authority area, however none are within 2 km of the Installation. The nearest automatic monitoring site CM6, 2.5 km south-west of the Installation located at Killingholme School. It monitors concentrations of NO_2 and PM_{10}.

Additionally, there is also an urban background Automatic Urban and Rural Network (AURN) monitoring site located within the neighbouring Northeast Lincolnshire Council (NELC) authority area, 4.9 km south-east, which monitors concentrations of NO_2, PM_{10} and $PM_{2.5}$.

These sites are included to provide additional data, despite being just outside the 2 km study area. The details of these automatic monitoring locations have been included in Table 4-3, with their locations presented in Figure 3.

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[12] UK Air website. Available at: https://uk-air.defra.gov.uk/aqma/ [Accessed August 2025].

[13] North Lincolnshire Council (NLC), 2024. 2024 ASR. Available at: https://www.nlincsair.info/home/text/358 [Accessed August 2025]

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Table 4-3: Details of Automatic Monitoring Sites within 2km of the Installation

Site ID	Site name	Site type	Council	Grid Reference	
				X	Y
CM6	Killingholme School	Other	North Lincolnshire	514880	416133
AURN	Immingham Woodlands Avenue	Urban Background	North East Lincolnshire	518277	415116

Table 4-4 shows the automatic monitoring results for NO_2 from 2019 to 2023, which are the most recent years of available monitoring data. No exceedances of the annual mean NO_2 AQS Objective were reported at either site across the five-year period. The maximum annual mean NO_2 concentration recorded was 15.0µg/m^3 in 2019, which is well below the NO_2 annual AQS Objective (40µg/m^3).

Despite being situated at Killingholme Primary School, site CM6 can be classed as representative of the Installation, since the monitoring site lies within 1km of the closest industrial facility. Due to both the Installation and CM6 being within an industrial area, pollutant concentrations at both are likely to be influenced by emissions released from industrial activities. As such, the pollutant concentrations at CM6 can be considered to be representative of the location of the Installation.

Table 4-4: Automatic Monitoring Results for Annual Mean NO_2 from 2019 to 2023

Site ID	Site name	Annual Mean NO_2 Concentration (µg/m^3)				
		2019	2020	2021	2022	2023
CM6	Killingholme School	15.0	13.0	14.0	14.0	13.0
AURN	Immingham Woodlands Avenue	13.5	11.0	12.1	11.7	10.4

NO_2 diffusion tube monitoring

There are 24 NO_2 diffusion tube monitoring sites within the NLC authority area, however, none are within 2km of the Installation. The nearest diffusion tube is Site 22, which is 2.5km south-west of the Installation. The details of this monitoring site are presented in Table 4-5 to provide an indication of the concentration at the closest monitoring site. The location is shown in Figure 3.

Table 4-5: Details of Diffusion Tube Monitoring Site within 2km of the Installation

Site ID	Site name	Site type	Grid Reference	
			X	Y
22	East Halton Road, Killingholme	Roadside	514141	417483

Table 4-6 shows the monitoring results for annual mean NO_2. Between 2019 and 2023, there have been no exceedances of the annual mean NO_2 AQS Objective (40µg/m^3), or recorded concentrations of more than 60µg/m^3 at the five different monitoring locations. Concentrations above 60µg/m^3 can indicate exceedances of the hourly mean NO_2 AQS Objective.

An annual mean NO_2 concentration of 21.4µg/m^3 was recorded at Site 22 in 2023, which is well below the annual mean NO_2 AQS Objective. This is not considered to be representative as it is a roadside site and located only 1m from the kerb.

Table 4-6: Diffusion Tube Monitoring Results for Annual Mean NO_2 from 2019 to 2023

Site ID	Site name	Annual Mean NO_2 Concentration (µg/m^3)				
		2019	2020	2021	2022	2023
22	East Halton Road, Killingholme	21.0	22.0	25.6	24.4	21.4

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Figure 3: Monitoring locations within 2km of the Installation

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4.3.3   Background Data

Background concentrations refer to the existing levels of pollution in the atmosphere, produced by a variety of stationary and non-stationary sources, such as roads and industrial processes. Defra has produced estimates of background NO_2 concentrations for each 1x1km OS grid square for each local authority area[14]. Background maps are available for 2021 and projected through to 2030.

Defra background pollutant concentrations for the baseline year of 2023 have been obtained for the grid squares in which the Installation is located and are shown in Table 4-7 together with continuous monitoring data for 2023 from the Immingham Woodlands Avenue AURN site for comparison. The year 2023 has been used as this is the most recent year for which monitoring data is available for the AURN site.

It can be observed that the annual mean concentrations of NO_2 for 2023 are below the AQS Objectives.

Recent background mapping of CO concentrations is not available for the most recent Defra maps, however Defra now advise using Pollution Climate Mapping (PCM) background maps in line with the Background Concentrations Maps User Guide[15]. Defra PCM background concentrations have been used in this assessment.

Table 4-7: Defra Background Pollutant Concentrations in 2023

Location	OS grid square		Annual mean concentrations (µg/m³)	
	X	Y	NO₂	CO
Installation boundary	515500	419500	9.4	211.4
AURN – Immingham Woodlands Avenue (NELC)			10.4	-
CM6 – Killingholme School (NLC)			13.0	-
AQS Objective			**40.0**	

The NELC AURN monitor is considered to be too far from the Installation to be representative of conditions there.

The CM6 monitor is considered to be representative of conditions at the Installation, and its concentrations are higher than the Defra background values at the Installation. As a result, the CM6 2023 background value has been used throughout the assessment for human receptors.

In line with the EA's Risk Assessment Guidance, short term background concentrations (hourly) are assumed to be twice the annual average concentration.

4.3.4   Summary of Human Health Air Quality Background Concentrations for use in the Assessment

Existing air quality conditions in the vicinity of the Installation have been evaluated through a review of local authority air quality management reports, Defra published data and other sources. The key pollutants of concern resulting from operation of the Installation, for which monitoring data on background concentration are available, are NO_2 and CO. The local monitoring site CM6's background concentration has been used throughout for human receptors and the Defra PCM background concentration has been used for CO.

4.4   Ecological Receptors Background Concentrations

The NO_x, nitrogen deposition and acid deposition background concentrations are available from the APIS website for designated SAC, SPA and SSSI sites. The annual average concentrations present at the relevant habitat receptor sites are presented in Table 4-8.

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[14] Defra, UK AIR, Air Information Resource, Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2021 [Accessed September 2025].

[15] 2021-based-background-maps-user-guide-v1.0.pdf

Table 4-8: APIS Background Data

Receptor I.D.	Ecology Site	Annual NOₓ (µg/m³)	Nitrogen Deposition (kg N/ha/yr)	Acid Deposition (Keq N/ha/yr)
E1	Humber Estuary SPA, Ramsar and SSSI	16.5	16.7	1.1
	North Killingholme Haven Pits SSSI			
	Halton Marsh Clay Pits LWS			
E2	SAC Humber Estuary SPA, Ramsar and SSSI	28.4	16.7	1.1
E3	Swallow Wold SSSI	9.0	15.3	0.9
E4	Wrawby Moor SSSI	10.9	36.5	1.4
E5		9.6	19.7	1.4
E6	Humber Estuary SPA, Ramsar, SSSI	11.9	16.7	1.1
E7	Burkinshaw's Covert LWS	15.2	30.7	1.2
E8	Burkinshaw's Covert LWS	15.2	30.7	1.2
E9	Chase Hill Wood LWS	15.2	31.2	1.2
E10	Chase Hill Wood LWS	15.2	31.2	1.2
E11	Scrub Lane Field LWS	17.0	17.0	1.2
E12	Swinster Lane Field LWS	11.5	17.0	1.2
E13	East View Meadow LWS	17.2	17.2	1.2
E14	Halton Marsh Clay Pits LWS	16.9	16.9	1.2

Although not explicitly stated in the EA's Risk Assessment Guidance, daily NOₓ background concentrations have been assumed to be 1.5 times the annual average concentration, as this is in line with advice provided by the EA on other projects.

The critical load information used in the assessment is provided below in Table 4-9. This has been derived based on information provided in the APIS database and in discussion with the project ecologists. It is noted that the Humber Estuary has more stringent CL's for dune type habitats listed, however it is considered that the locations of these habitats are over 15km from the Installation (located at Welwick 17km east, Cleethorpes 19km southeast and Spurn Point 25km southeast) and therefore are not likely to be impacted by the emissions from it.

Table 4-9: APIS Critical Load Information – Nitrogen Deposition

Receptor ID	Ecological designation name	Designation	Type	Critical load class	Nitrogen CLd (min)	Nitrogen CLd (max)
E1	Humber Estuary	SPA, Ramsar and SSSI	Grassland	Atlantic upper-mid & mid-low salt marshes	10	20
	North Killingholme Haven Pits	SSSI				
	Halton Marsh Clay Pits	LWS				
E2	Humber Estuary	SAC	Grassland	Atlantic upper-mid & mid-low salt marshes	10	20

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Receptor ID	Ecological designation name	Designation	Type	Critical load class	Nitrogen CLd (min)	Nitrogen CLd (max)
E3	Swallow Wold	SSSI	Grassland	Semi-dry perennial calcareous grassland (basic meadow steppe).	10	20
E4	Wrawby Moor	SSSI	Woodland	Carpinus and Quercus mesic deciduous forest	15	20
E4	Wrawby Moor	SSSI	Grassland	Lowland to montane, dry to mesic grassland	6	10
E5	Humber Estuary,	SPA, Ramsar, SSSI	Grassland	Atlantic upper-mid & mid-low salt marshes	10	20
E6	Burkinshaw's Covert	LWS	Woodland	Coniferous woodland	10	10
E7	Burkinshaw's Covert	LWS	Woodland	Coniferous woodland	10	10
E8	Chase Hill Wood	LWS	Woodland	Broadleaved deciduous woodland	10	15
E9	Chase Hill Wood	LWS	Woodland	Broadleaved deciduous woodland	10	15
E10	Scrub Lane Field	LWS	Grassland	Calcareous grassland	10	20
E11	Swinster Lane Field	LWS	Grassland	Calcareous grassland	10	20
E12	East View Meadow	LWS	Grassland	Semi-dry perennial calcareous grassland (basic meadow steppe)	10	20
E13	Halton Marsh Clay Pits	LWS	Grassland	Calcareous grassland	10	20
E14	Humber Estuary	SPA	Grassland	Atlantic upper-mid & mid-low salt marshes	10	20

4.5   Industrial Processes

Industrial air pollution sources are regulated through a system of operating permits or authorisations, requiring stringent emission limits to be met, and ensuring that any releases to the environment are minimised or rendered harmless. Regulated (or prescribed) industrial processes are classified as Part A (1), A (2), Part B or Medium Combustion Plant (MCP) processes and are regulated through the Environmental Permitting (England and Wales) Regulations 2016 (as amended[2]) which transpose the IED into UK legislation. The larger, more polluting processes are regulated by the EA and the smaller less polluting ones by the local authorities. Local authorities focus on regulation for emissions to air, whereas the EA regulates emissions to air, water and land.

There are six Part A(1) processes within 2km of the Installation with releases to air, according to the EA website[16]. These are outlined in Table 4-10.

Table 4-10: Industrial Processes Within 2 km of the Installation

Facility and operator	Schedule 1 listed activity	Approximate distance from the Proposed Development (at the closest point)
VPI Immingham Energy Park A VPI Immingham Energy Park A Limited	Combustion activities; any fuel >50MW. Section 1.1 Part A(1) (a).	450m

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[16] EA, 2025. Environmental permitting regulations – installations website. Available at: https://environment.data.gov.uk/public-register/view/search-industrial-installations [Accessed August 2025]

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Facility and operator	Schedule 1 listed activity	Approximate distance from the Proposed Development (at the closest point)
Killingholme Power Station Uniper UK Limited	Combustion activities; any fuel >50MW. Section 1.1 Part A(1) (a).	Directly adjacent
VPI Immingham OCGT Power Station VPI Immingham B Limited	Combustion activities; any fuel >50MW. Section 1.1 Part A(1) (a).	160m
Immingham CHP Power Plant VPI Immingham LLP	Combustion activities; any fuel >50MW. Section 1.1 Part A(1) (a).	170m
Lindsey Oil Refinery PRAX*	Manufacture of refined petroleum products; Section 1.2 Part A(1)(d). Combustion activities; any fuel >50MW. Section 1.1 Part A(1) (a).	Directly adjacent
Humber Oil Refinery Phillips 66 Limited	Manufacture of refined petroleum products; Section 1.2 Part A(1)(d). Combustion activities; any fuel >50MW. Section 1.1 Part A(1) (a).	700m
* The Lindsey Oil Refinery operations are currently under review and may cease in the near future. As the site is still permitted, it has been included here for reference.		

The VPI Immingham Energy Park A commenced operation in December 2024 and the VPI Immingham OCGT Power Plant is not yet operational. Neither of these sites will therefore be included in the Defra background concentrations. However, both these developments are peaking plants and will have annual operational hours of <1,500 hours (limited through their Environmental Permits) and therefore are unlikely to result in significant increases in the annual background concentrations of NO_x or CO as a result of their operation. As such, no consideration of the impacts of these sites have been included in the assessment.

It is considered that the contributions of releases to air from all other processes listed would already be included in the Defra background concentrations.

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5. Dispersion Model Parameters

5.1 Emissions Inventory

In addition to the CCGT (Emission Point A1) there will also be an auxiliary boiler (Emission Point A2), two emission points for JT Heaters (Emission Points A3 and A4), and an EDG (Emission Point A5).

It is assumed in the assessment that the CCGT will be operational for 8,760 hours per year, as a worst case, however the actual operational hours will be less than this due to maintenance outages and dependent on grid demand. Combustion emissions will be released at the LCP BAT-AELs, which can have an uplift applied where the electrical efficiency (EE) of the CCGT is greater than 55%. As detailed in Section 4.4.2 of the Main Supporting Document, the anticipated EE of the CCGT is 59% and therefore the NO_x BAT-AELs have been uplifted accordingly.

The auxiliary boiler will provide steam during start-up and shut-down events only and the proposed operating regime will result in approximately 12-15 start-ups and shutdowns per annum. Therefore, the operation of the auxiliary boiler would be limited to a few hours of operation at intermittent intervals and is likely to only operate for approximately 35 to 40 hours per annum. To ensure a conservative assessment has been carried out however, it has been assumed that the auxiliary boiler will be operational for a maximum of 500 hours per year.

Likewise, the JT Heaters are only required when the temperature of the gas downstream of the gas pressuring reducing station falls below a set point (which is anticipated to be approximately 15 °C). Operational hours are therefore unknown, however for the purpose of assessment, it has been assumed that they would be operational for 500 hours a year.

It is considered that due to the small size of the EDG and the low annual running hours it is unlikely that it would have a discernible impact at the receptor locations so it is not considered further in this assessment. However, the Simple Calculation of Atmospheric Impact Limits (SCAIL) tool[17] has been used to undertake an assessment of the EDG to demonstrate this. The details of the SCAIL assessment are provided in Annex A.

The emission parameters for sources A1 to A4 are provided below in Table 5-1. The locations are shown in Figure 4.

Table 5-1: Modelled Emission Parameters

Parameter	A1	A2	A3	A4
Source name	CCGT	Auxiliary Boiler	JT Heater 1	JT Heater 2
Location (NRG)	515620, 419689	515744, 419739	515693, 419613	515699, 419615
Stack height (m) (above finished ground level)	80.0	15.0	10.0	10.0
Approx. flue diameter (m)	8.3	0.8	0.5	0.5
Actual volumetric flow (Am³/s)	856.0	10.6	4.5	4.5
Average efflux velocity (m/s)	15.8	21.1	23.1	23.1
Oxygen content (%)	13.0	3	3	3
Moisture content (%)	8.5	3	3	3
Temperature (°C)	73.8	130.0	160.0	160.0

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[17] CEH, 2025. Simple Calculation of Atmospheric Impact Limits (SCAIL) tool. Available at: https://www.scail.ceh.ac.uk/ [Accessed September 2025]

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Parameter		A1		A2		A3		A4	
Source name		CCGT		Auxiliary Boiler		JT Heater 1		JT Heater 2	
Normalised volumetric flow (Nm³/s)[1]		775.0		7.2		2.9		2.9	
Emission Limit Values		**Hourly**	**Annual**	**Hourly**	**Annual[2]**	**Hourly**	**Annual[2]**	**Hourly**	**Annual[2]**
NO$_x$	Concentration (mg/Nm³)	42.9[4]	32.2[5]	100.0	-	100.0	-	100.0	-
	Emission rate (g/s)	33.2	24.9	0.7	0.04	0.3	0.02	0.3	0.02
CO	Concentration (mg/Nm³)	100.0	-	80.0	-	80.0	-	80.0	-
	Emission rate (g/s)	77.5	-	0.6	-	0.2	-	0.2	-

[1] At 0°C, dry gas, 15% Oxygen

[2] Prorated for 500 hours operation per year, as this is considered the maximum likely operation

[3] No information available, however it considered that not correcting the normalised flow rate for these parameters lead to a conservative assessment.

[4] Based on the daily BAT-AEL with the EE correction applied 40 mg/Nm³ x 59 / 55 = 42.9mg/Nm³

[5] Based on the annual BAT-AEL with the EE correction applied 30 mg/Nm³ x 59 / 55 = 32.2mg/Nm³

5.2 Buildings and Terrain

The presence of buildings or structures near to the emission points can have a significant effect on the dispersion of emissions. The wind field can become entrained into the wake of buildings, which causes the wind to be directed to ground level more rapidly than in the absence of a building. If an emission is entrained into this deviated wind field, this can give rise to elevated ground-level concentrations. Building effects are typically considered where a structure of height greater than 40% of the stack height is situated within 8 - 10 stack heights of the emissions source.

Buildings associated with the Installation that have been considered to be of sufficient height and volume to potentially impact on the dispersion of emission stacks are shown in Table 5-2. The dimensions of the buildings included in the model are the maximum measurements that could potentially be required and have been provided by the Design Engineers.

A plan showing the buildings layout used in the ADMS simulation is shown in Figure 4.

Table 5-2: Buildings Included with the Model Set-Up

Building Name	X	Y	Height (m)	Length (m)	Width (m)	Angle (°)
HRSG	515649	419699	45	48	26	65
Turbine Hall	515703	419716	32	64	54	65
Auxiliary boiler building	515739	419737	6	16	18	65
Cooling Tower building	515831	419742	29	44	83	65

Site-specific terrain data has not been used in the model, as typically terrain data will only have a marked effect on predicted concentrations where hills with gradient of more than 1 in 10 are present in the vicinity of the source. There are no potentially significant changes in gradient within the study area.

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Figure 4: Modelled Building Layout
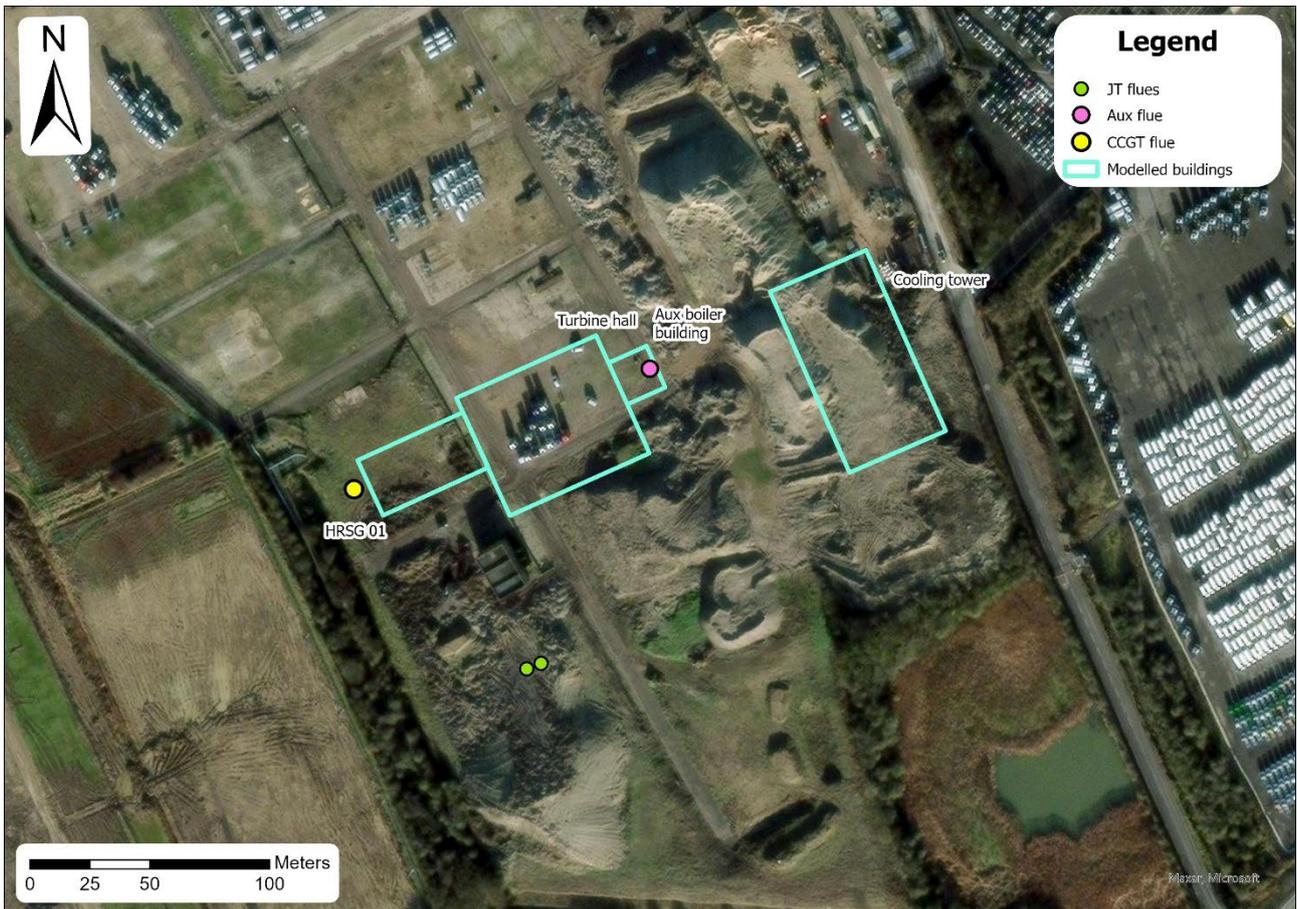
5.3 Meteorological Data

The meteorological site used in the assessment is Humberside Airport and the most recent five years of hourly sequential meteorological data has been used in the assessment to account for recent climate change and interannual variability. The meteorological data used in this assessment is for 2020 to 2024. This site was chosen as it is the closest to the Installation and is approximately 8.5km south-west and at a flat airfield in a principally agricultural area, and therefore a surface roughness of 0.5m (representative of 'Parkland, open suburbia') has been selected for the meteorological site within the model.

Defra's LAQM.TG22 guidance[18] recommends that the meteorological data file is tested in a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 85%.

The 2020-2024 datasets include usable data corresponding to 99.7%, 99.5%, 94.8%. 97.2% and 94.1% respectively. This is above the 85% threshold, so meets the requirements of the Defra guidance and is adequate for the dispersion modelling. Figure 5 shows the wind roses for Humberside Airport for 2020 to 2024. It can be seen that the predominant wind direction is south westerly.

Sensitivity of the model to the different years of meteorological data used is provided in Annex B.

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[18] Defra (2022) LAQM.TG(22). Available at: https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.pdf [Accessed April 2025].

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Figure 5: Windroses for Humberside Airport 2020 – 2024

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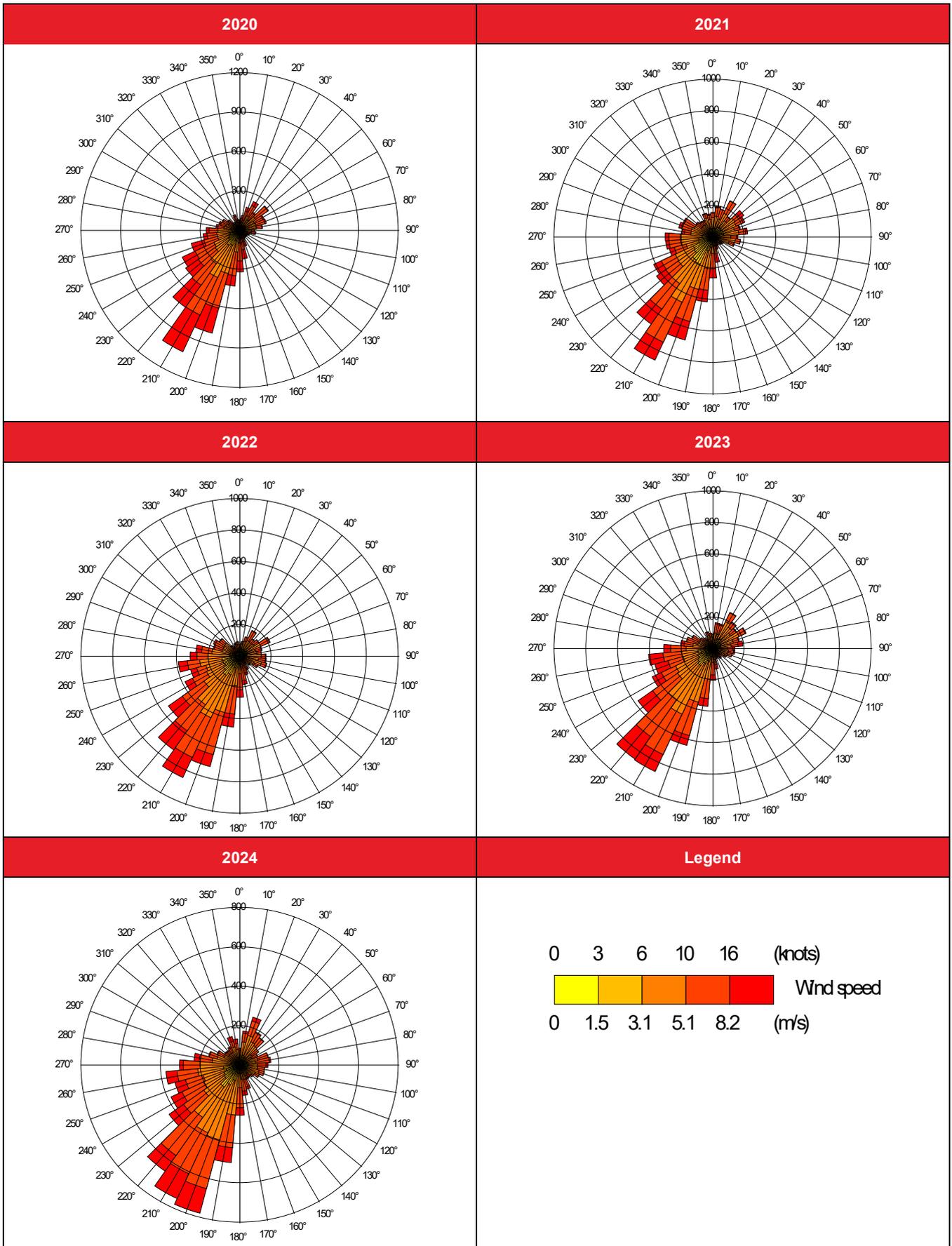
5.4 Other Model Parameters

The local area immediate to the Installation is flat agricultural land, with the urban area of Immingham approximately 4km to the south and the Humber estuary to the east. A surface roughness of 0.5m, corresponding to 'Parkland, open suburbia' has been used in the assessment to represent the local terrain.

Sensitivity of the model to the different surface roughness is provided in Annex B.

A cartesian grid system was also included in the model to allow the production of contour plots, although results have been presented at the discrete receptor points included in the model. A grid domain of 3km by 3km, with grid spacing at 60m and was set at 1.5m in height to represent average human exposure, in line with the discrete point human receptors to determine the maximum concentration beyond the Installation Boundary.

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6. Predicted Results

6.1 Introduction

The process contributions (PCs) of pollutants from the dispersion modelling for human health impacts, and for impacts at designated statutory and non-statutory ecological receptors, are presented in this Section, and are compared against the relevant AQS objectives, EALs, CLs and CLds and screening criteria, as per EA's Risk Assessment Guidance.

The dispersion modelling includes several conservative assumptions in combination, including:

- Emission concentrations for the CCGT are calculated based on the use of the upper BAT-AELs; in practice annual average emissions rates would be below this to enable continued compliance with Environmental Permit requirements;

- Maximum annual operation for the CCGT has been assessed (8,760 hours, assuming the plant is used for baseloading as a worst case);

- Maximum annual operation for the auxiliary boiler and JT heaters assumed to be 500 hours per year, however it is considered that actual operation will be significantly less;

- Reporting of the worst-case results from the five years of meteorological data modelled;

- Conservative estimates of background concentrations for the commencement of operation at the receptor locations.

Contour maps showing the maximum predicted annual mean and short-term process contributions of NO_2 and NO_x for the worst-case impacts from the two scenarios modelled are provided in Figures 6 to 9.

6.2 Human Health Receptor Results

The impact of the Installation's PCs at human health receptors, has been determined from the maximum model output that occurs anywhere beyond the Installation boundary, in the first instance, and where this cannot be screened as insignificant, impacts at receptor locations have been provided. The results for all receptor locations are provide in Annex C.

6.2.1 Annual Emissions

Nitrogen Dioxide Impacts

The maximum impacts across the 3km x 3km modelled grid area for the annual mean NO_2 PC occurs at the CAT Automative Terminal approximately 250-300m north-east of the Installation. The maximum annual mean NO_2 PC across the modelled grid was predicted to be 1.9µg/m³, which represents 4.6% of the relevant AQS Objective (40µg/m³). This can therefore not be screened as insignificant at the first stage of screening, however the maximum PEC for annual mean NO_2 was predicted to be 14.9µg/m³, which is well below the AQS Objective and less than 70% of the AQS objective. Since the second EA screening criteria is not exceeded, the impacts of the operation of the Installation for annual mean NO_2 can be considered to be **insignificant** at the point of maximum impact and therefore also across the remainder of the modelled grid and at identified receptor locations.

Contour maps of the annual NO_2 PCs are shown in Figure 6 for the year 2020, which was the worst case meteorological year for the annual averages.

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Figure 6: Contour Plot of the Annual Mean NO₂ PCs for 2020

6.2.2 Short-term Impacts

Nitrogen Dioxide Impacts

The maximum impacts across the modelled grid area for the hourly mean NO$_2$ PC and PEC occur approximately 70m to the east of the Installation adjacent to the CAT Automative Terminal. For hourly mean NO$_2$, the maximum PC predicted was 77.8µg/m^3. This is greater than 10% of the AQS objective, representing 38.9%. The maximum PEC predicted was 103.8µg/m^3. This is above the secondary short term screening criteria, but is well below the AQS Objective (200µg/m^3).

When considering the predicted concentrations at the specific discrete human sensitive receptor locations however, neither screening criteria are exceeded and the results are **insignificant** at all discrete human receptor locations. The highest PC predicted was 6.9µg/m^3 at receptor R4, this is 3.4% of the AQS objective and therefore less than 10%.

The contours for hourly mean NO$_2$ are shown below in Figure 7 for the meteorological year 2024, which is the worst case for short-term averages.

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Figure 7: Contour Plot of the Hourly Mean NO₂ PCs for 2024

Carbon Monoxide Impacts

For hourly CO, the maximum impacts occur approximately 100m to the east of the Installation adjacent to the CAT Automative Terminal. The maximum hourly rolling PC predicted across the modelled grid was 195.1.0µg/m³, which is less than 10% of the EAL (30,000µg/m³). The maximum PEC was 617.9µg/m³, well below the secondary short term screening criteria and the EAL. The hourly CO impacts are therefore **insignificant** at the point of maximum impact and as a result, at all other points in the grid.

The maximum impacts across the modelled grid area for the 8-hour rolling CO PC and PEC occur approximately 70m to the east of the Installation adjacent to the CAT Automative Terminal. The maximum 8-hr rolling PC predicted across the modelled grid was 154.4µg/m³, which is less than 10% of the AQS Objective (30,000µg/m³). The maximum PEC was 577.2µg/m³, well below the secondary short term screening criteria and the AQS Objective. The 8-hour rolling CO impacts are therefore **insignificant** at the point of maximum impact and as a result, at all other points in the grid.

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Table 6-1: Human Health Impacts – Maximum Impacts Beyond the Installation Boundary (unless where stated)

Pollutant	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	PC/(AQS – 2 x BC)	2nd Stage Screened as Insignificant?
NO₂ hourly mean (as the 99.79th percentile)	200	77.8	38.9%	**No**	26.0	103.8	51.9%	44.7%	**No**
NO₂ hourly mean (as the 99.79th percentile) Worst-case Receptor Location		6.9	3.4%	Yes 10% of the AQS		32.9	16.4%	4.0%	Screened at Stage 1
NO₂ annual mean	40	1.9	4.6%	**No**	13.0	14.9	37.1%	-	Yes PEC <70% AQS
CO 1-hour mean (as the 100th percentile)	30,000	195.1	0.7%	Yes 10% of the AQS	422.8	617.9	2.1%	0.7%	Screened at Stage 1
CO 8-hour rolling mean	10,000	154.4	1.5%	Yes 10% of the AQS	422.8	577.2	5.8%	1.6%	Screened at Stage 1
PC = Process Contribution, AQS = Air Quality Standard objective or EAL, BC = Background Concentration, PEC = Predicted Environmental Concentration									

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6.3　Ecological Results

The impact of the Installation's PCs at the individual ecological receptors, has been determined from the model output and are detailed below. The highest annual mean and daily mean NO_x results are provided in Table 6-2.

6.3.1　Impacts Against Critical Levels

NO_x – Annual mean

The highest annual mean NO_x PC is predicted at receptor E2 (Humber Estuary SAC) and is $0.9\mu g/m^3$ or 3.0% of the CL ($30\mu g/m^3$) and therefore exceeds the first screening criteria. The highest PEC of annual mean NO_x was $26.3\mu g/m^3$ at receptor E2, which is greater than 70% of the CL due to the very high background concentration in this location. Whilst the results indicate impacts at this receptor cannot be considered as insignificant, there remains considerable headroom between the PEC and the CL, and considering the numerous worst-case assumptions used in the assessment it can be considered that the results are **not significant**.

Annual mean NO_x concentrations are **insignificant** at all other modelled ecological receptors, as shown in Table 6-2 below. The contour plot shows that the maximum PCs occur over an industrial area where the CLs do not apply.

Contour maps of the annual NO_x PCs are shown in Figure 8 for the year 2020, which was the worst case meteorological year for the annual averages.

Figure 8: Contour Plot of the Annual Mean NO_x PCs for 2020

NO_x – Daily Mean

The highest NO_x daily mean PC is predicted at receptor E1 (Humber Estuary Ramsar/ SAC/ SSSI) and is $26.1\mu g/m^3$. The highest PEC of daily NO_x was $56.7\mu g/m^3$ at receptor E2 and exceeds the second screening

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criteria. This is above both the short term screening criteria, so these results cannot be screened as insignificant. However, this PEC is well below the relevant CL ($75\mu g/m^3$) indicating that these results are **not significant**.

Where background SO_2 and ozone levels are low, a less stringent CL of 200 $\mu g/m^3$ can also be considered. Compared to this CL, the maximum impacts represent only 13% of the CL and would be screened as insignificant at the second screening level.

Daily mean NO_x results for all ecological receptors are shown below in Table 6-3.

Contour maps of the daily NO_x PCs are shown in Figure 9 for the year 2024, which was the worst case meteorological year for the short-term averages. The contour plot shows that the maximum PCs occur over a very small area directly surrounding the Installation, and is considered to be dominated by the emissions from the auxiliary boiler and JT heaters, due to the shorter stack heights associated with these sources. It is considered highly unlikely that either of these sources would be operational continuously for 24 hours, and therefore it is considered that the daily NO_x results are very conservative.

Figure 9: Contour Plot of the Daily Mean NOx PCs for 2024
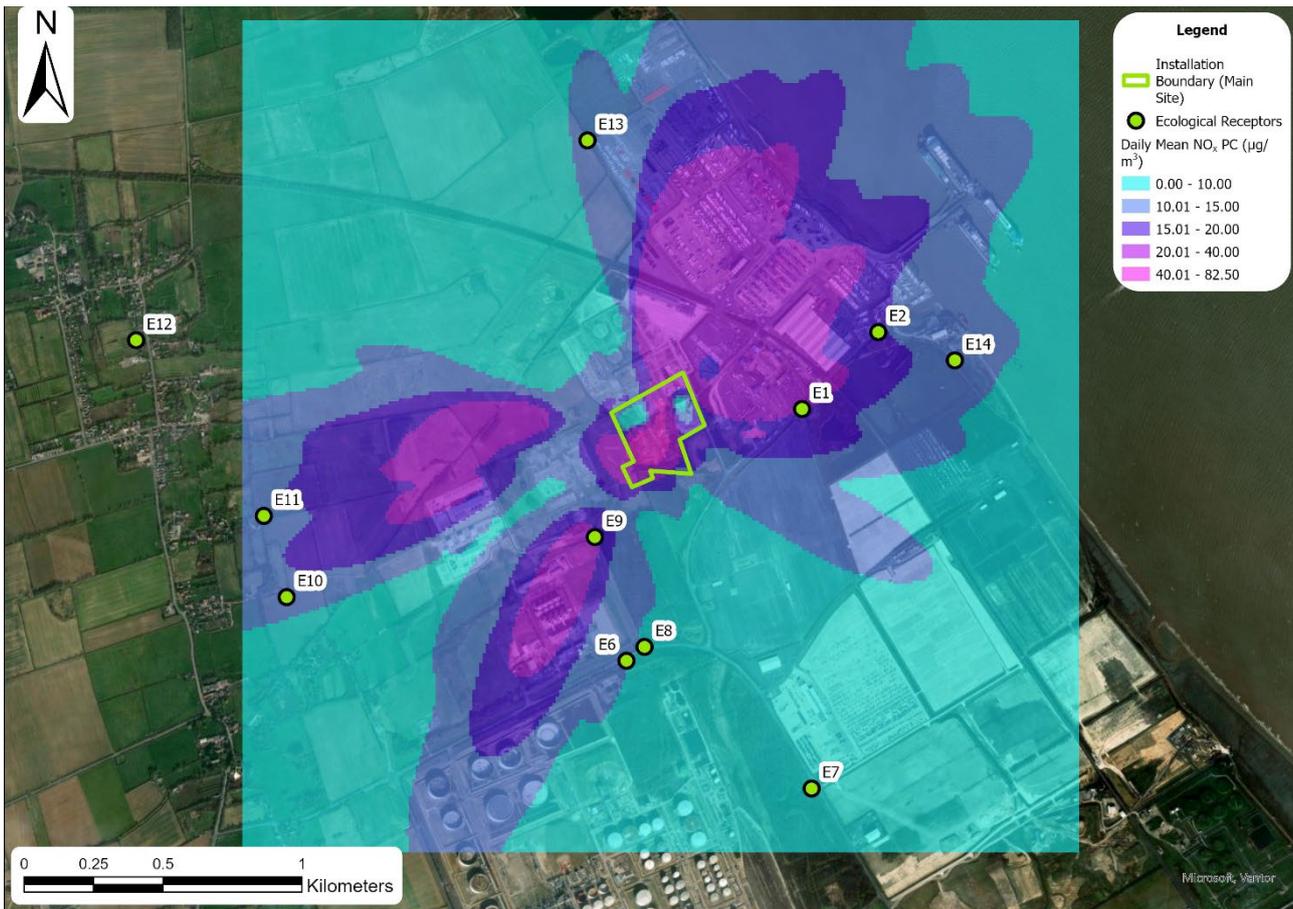
6.3.2   Depositional Impacts

Nitrogen Deposition

The nitrogen deposition has been calculated for the Installation and can be screened out as being **insignificant** using the stage 1 criteria, as the PC is 1% or less of the relevant CLds for all ecological receptors assessed. The nitrogen deposition results are shown below in Table 6-4. A figure showing the nitrogen deposition contours is provided in Figure 10.

Acid Deposition

Acid deposition was also assessed and can also be screened out as the PC is less than 1% of the relevant CLd's for all ecological receptors assessed apart from E9, Chase Hill Wood LWS. The PC is 1.2% of the CLd, which

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is acceptable for an LWS according to EA guidance[1]. The acid deposition results are shown below in Table 6-5.

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Table 6-2: Annual Mean NOₓ Dispersion Modelling Results for Ecological Receptors

Receptor I.D.	Site	CL (µg/m³)	PC (µg/m³)	PC % of CL	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC % of CL	2nd Stage Screened as Insignificant?
E1	Humber Estuary SPA, Ramsar and SSSI		0.9	3.0%	**No**	14.8	15.7	52.3%	Yes PEC < 70% of CL
	North Killingholme Haven Pits SSSI								
	Halton Marsh Clay Pits LWS				Yes as PC <100%				Screened at Stage 1
E2	SAC Humber Estuary SPA, Ramsar and SSSI		1.0	3.3%	**No**	25.3	26.3	87.8%	Not screened out but below the CL so considered **not significant**.
E3	Swallow Wold SSSI	30	0.03	0.1%	Yes as PC <1%	8.4	8.4	27.9%	Screened at Stage 1
E4	Wrawby Moor SSSI		0.03	0.1%	Yes as PC <1%	8.4	8.5	28.2%	
E5	Humber Estuary SPA, Ramsar and SSSI		0.04	0.1%	Yes as PC <1%	9.6	9.6	32.1%	
E6	Humber Estuary SPA, Ramsar, SSSI		0.2	0.8%	Yes as PC <1%	13.8	14.1	46.9%	
E7	Burkinshaw's Covert LWS		0.1	0.5%	Yes as PC <100%	12.7	12.8	42.7%	
E8	Burkinshaw's Covert LWS		0.2	0.7%	Yes as PC <100%	13.8	14.0	46.8%	
E9	Chase Hill Wood LWS		0.3	0.9%	Yes as PC <100%	12.2	12.5	41.7%	
E10	Chase Hill Wood LWS		0.4	1.2%	Yes as PC <100%	10.4	10.7	35.8%	
E11	Scrub Lane Field LWS		0.3	1.1%	Yes as PC <100%	10.4	10.7	35.7%	
E12	Swinster Lane Field LWS		0.2	0.8%	Yes as PC <100%	9.9	10.1	33.7%	
E13	East View Meadow LWS		0.5	1.8%	Yes as PC <100%	12.0	12.6	41.8%	
E14	Halton Marsh Clay Pits LWS		0.8	2.7%	Yes as PC <100%	14.8	15.6	52.0%	
PC = Process Contribution, CL = Critical Level, BC = Background Concentration, PEC = Predicted Environmental Concentration									

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Table 6-3: Daily Mean NOₓ Dispersion Modelling Results for Ecological Receptors

Receptor I.D.	Site	CL (µg/m³)	PC (µg/m³)	PC % of CL	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC % of CL	2nd Stage Screened as Insignificant?
E1	Humber Estuary SPA, Ramsar and SSSI		26.1	34.8%	No	22.2	48.2	64.3%	Not screened out but below the CL so considered **not significant**.
	North Killingholme Haven Pits SSSI								
	Halton Marsh Clay Pits LWS				Yes as PC <100%				Screened at Stage 1
E2	SAC Humber Estuary SPA, Ramsar and SSSI		18.6	24.8%	No	38.0	56.7	75.5%	Not screened out but below the CL so considered **not significant**.
E3	Swallow Wold SSSI		0.6	0.8%	Yes as PC <10%	12.5	13.1	17.5%	Screened at Stage 1
E4	Wrawby Moor SSSI		0.8	1.1%	Yes as PC <10%	12.6	13.5	17.9%	
E5	Humber Estuary SPA, Ramsar and SSSI	75	1.1	1.5%	Yes as PC <10%	14.4	15.5	20.7%	
E6	Humber Estuary SPA, Ramsar, SSSI		11.1	14.7%	No	20.7	31.8	42.4%	Not screened out but below the CL so considered **not significant**.
E7	Burkinshaw's Covert LWS		8.0	10.7%	Yes as PC <100%	19.0	27.0	36.0%	Screened at Stage 1
E8	Burkinshaw's Covert LWS		10.2	13.5%	Yes as PC <100%	20.7	30.9	41.2%	
E9	Chase Hill Wood LWS		22.7	30.2%	Yes as PC <100%	18.3	41.0	54.7%	
E10	Chase Hill Wood LWS		13.3	17.7%	Yes as PC <100%	15.6	28.9	38.5%	
E11	Scrub Lane Field LWS		14.2	18.9%	Yes as PC <100%	15.6	29.7	39.7%	
E12	Swinster Lane Field LWS		9.7	13.0%	Yes as PC <100%	14.8	24.5	32.7%	
E13	East View Meadow LWS		12.3	16.4%	Yes as PC <100%	18.0	30.3	40.5%	
E14	Halton Marsh Clay Pits LWS		17.7	23.6%	Yes as PC <100%	22.2	39.8	53.1%	

PC = Process Contribution, CL = Critical Level, BC = Background Concentration, PEC = Predicted Environmental Concentration

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Table 6-4: Highest Nutrient Nitrogen Deposition (Kg/Ha/Yr) Results

Receptor ID	Site Name	BDep (kg N/ha/yr)	Lowest CLd Class Applicable	Lower Value of CLd Range	PC (kg N/ha/yr)	PC % CLd	1st Stage Screened as Insignificant?
E1	Humber Estuary, North Killingholme Haven Pits, Halton Marsh Clay Pits	16.7	Atlantic upper-mid & mid-low salt marshes	10	0.10	1.0%	
E2	Humber Estuary	16.7	Atlantic upper-mid & mid-low salt marshes	10	0.10	1.0%	
E3	Swallow Wold	15.3	Semi-dry Perennial calcareous grassland (basic meadow steppe).	10	< 0.1	0.0%	
E4		36.5	Carpinus and Quercus mesic deciduous forest	15	< 0.1	0.0%	
E4	Wrawby Moor	19.7	Lowland to montane, dry to mesic grassland usually dominated by Nardus stricta	15	< 0.1	0.0%	
E5	Humber Estuary	16.7	Atlantic upper-mid & mid-low salt marshes	10	< 0.1	0.0%	
E6	Burkinshaw's Covert	30.7	Coniferous Woodland	10	< 0.1	0.5%	Yes
E7	Burkinshaw's Covert	30.7	Coniferous Woodland	10	< 0.1	0.3%	
E8	Chase Hill Wood	31.2	Broadleaved deciduous woodland	10	< 0.1	0.5%	
E9	Chase Hill Wood	31.2	Broadleaved deciduous woodland	10	0.1	0.6%	
E10	Scrub Lane Field	17.0	Calcareous grassland	10	< 0.1	0.4%	
E11	Swinster Lane Field	17.0	Calcareous grassland	10	< 0.1	0.4%	
E12	East View Meadow	17.2	Semi-dry Perennial calcareous grassland (basic meadow steppe).	10	< 0.1	0.3%	
E13	Halton Marsh Clay Pits	16.9	Calcareous grassland	10	0.1	0.6%	
E14	Humber Estuary – SPA salt meadow habitat	16.6	Atlantic upper-mid & mid-low salt marshes	10	0.09	0.9%	
PC = Process Contribution, CLd = Critical Load, BDep = Background Deposition, PEC = Predicted Environmental Concentration							

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Table 6-5: Acid Deposition N (Keq/Ha/Yr) Results

Receptor ID	Site Name	Acid Deposition			PC Acid Deposition (keq/ha/yr)		Exceedance summary
		CLd (keq/ha/yr)	BDep N (keq/ha/yr)	Lowest CLd Class Applicable	PC	PC % of CLd	
E1	Humber Estuary, North Killingholme Haven Pits, Halton Marsh Clay Pits	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 0.42	1.05	Calcareous grassland (using base cation)	0.01	0.6%	
E2	Humber Estuary	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 4.00	1.05	Calcareous grassland (using base cation)	0.01	0.7%	
E3	Swallow Wold	Min CL Min N: 0.856 Min CL Max N: 4.856 Min CL Max S: 4.00	0.9	Calcareous grassland (using base cation)	< 0.01	0.0%	
E4	Wrawby Moor	Min CL Min N: 0.285 Min CL Max N: 1.033 Min CL Max S: 0.748	1.35	Unmanaged Broadleafed /Coniferous Woodland	< 0.01	0.2%	
E4		Min CL Min N: n/a Min CL Max N: n/a Min CL Max S: 0.748	1.35	Unmanaged Broadleafed/Coniferous Woodland	< 0.01	0.2%	PC < CLd indicating no exceedance.
E5	Humber Estuary	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 0.42	1.05	Calcareous grassland (using base cation)	< 0.01	0.0%	
E6	Burkinshaw's Covert	Min CL Min N: 0.357 Min CL Max N: 2.67 Min CL Max S: 2.31	1.2	Broadleafed/Coniferous unmanaged woodland	< 0.01	1.0%	
E7	Burkinshaw's Covert	Min CL Min N: 0.357 Min CL Max N: 2.67 Min CL Max S: 2.31	1.2	Broadleafed/Coniferous unmanaged woodland	< 0.01	0.6%	
E8	Chase Hill Wood	Min CL Min N: 0.357 Min CL Max N: 2.67	1.2	Broadleafed/Coniferous unmanaged woodland	< 0.01	0.9%	

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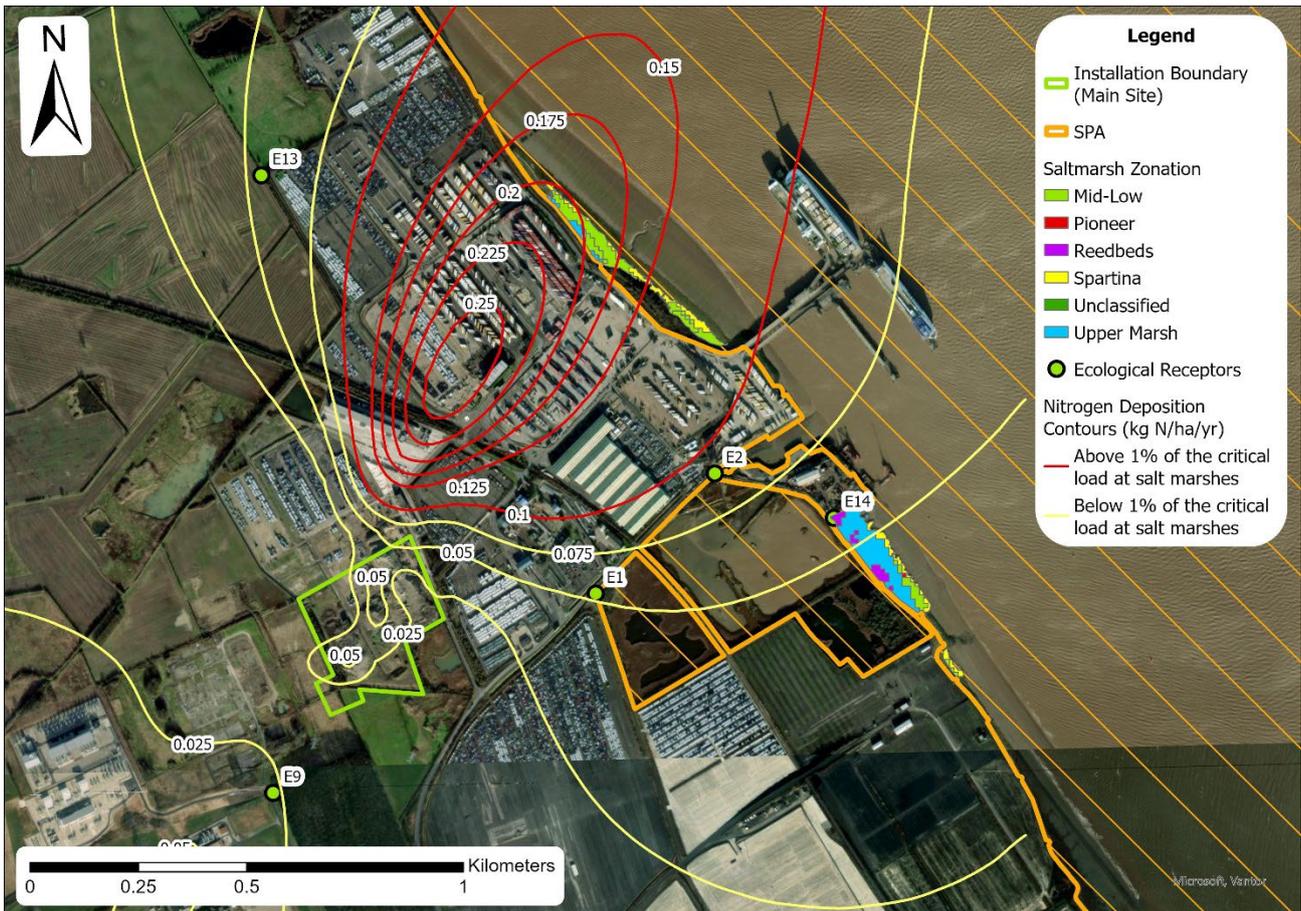| Receptor ID	Site Name	Acid Deposition			PC Acid Deposition (keq/ha/yr)		Exceedance summary
		CLd (keq/ha/yr)	BDep N (keq/ha/yr)	Lowest CLd Class Applicable	PC	PC % of CLd	
		Min CL Max S: 2.31					
E9	Chase Hill Wood	Min CL Min N: 0.357 Min CL Max N: 2.67 Min CL Max S: 2.31	1.2	Broadleafed/Coniferous unmanaged woodland	< 0.01	1.2%	
E10	Scrub Lane Field	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 4.00	1.21	Calcareous grassland	< 0.01	0.3%	
E11	Swinster Lane Field	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 4.00	1.21	Calcareous grassland	< 0.01	0.2%	
E12	East View Meadow	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 4.00	1.23	Calcareous grassland (using base cation)	< 0.01	0.2%	
E13	Halton Marsh Clay Pits	Min CL Min N: 1.07 Min CL Max N: 5.07 Min CL Max S: 4.00	1.2	Calcareous grassland	< 0.01	0.4%	
E14	Humber Estuary – SPA salt meadow habitat	Min CL Min N: 0.321 Min CL Max N: 0.484 Min CL Max S: 0.163	1.05	Calcareous grassland (using base cation)	0.01	0.6%	
PC = Process Contribution, CLd = Critical Load, BDep = Background Deposition, PEC = Predicted Environmental Concentration							

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6.4 In-combination Effects of Ecological Impacts

The EA's Risk Assessment requires the consideration of 'in combination' (combined) impacts of all permissions for SPAs, SACs and Ramsar sites, and therefore consideration of these impacts on the Humber Estuary are required.

It should be noted that the Lindsey Oil Refinery is currently anticipated to cease operations and therefore it is considered that this could lead to a considerable reduction in NOx emissions and therefore is likely to lead to a reduction in the background concentrations in the area.

The North Killingholme Power Project (the Installation) was originally consented through the Development Consent Order (DCO) process in 2014 and permitted in 2017. It has therefore been considered in the cumulative impact assessments that have been carried out for a number of proposed developments that have undergone consenting since such as:

- VPI Immingham Energy Park A;

- VPI Immingham OCGT Power Plant (PA/SCO/2018/3);

- Immingham Green Energy Terminal (PA/SCO/2022/9); and

- VPI Immingham CHP Power Plant and Phillips 66 Humber Refinery carbon capture plants (PA/2023/421 and PA/2023/422 respectively).

It is recognised that a further proposed development in the Humber Hub (Green) Project (PA/SCO/2024/4) is also currently undergoing the planning process, however again, it is considered that the Installation will be considered in any in-combination assessment carried out for that scheme.

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It should be noted that in the cumulative assessments carried out by these schemes, information in the planning domain for the Installation would have included an assessment of NOx emissions at the higher IED ELV of 50mg/Nm^3, whereas the emissions from the Installation now being developed will be at the BAT-AELs, and therefore lower that originally assessed.

It is therefore considered that the in-combination effects of the Installation have been assessed through the planning process, and therefore no further assessment is required.

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7. Conclusions

This report has considered and assessed the impacts of the Installation on local air quality. A review of current legislation and a baseline assessment describing the current air quality conditions in the vicinity of the Installation has also been undertaken.

Monitoring data within 2km of the Installation showed that there are no exceedances of the annual mean NO_2 air quality standard ($40\mu g/m^3$). Defra background concentrations for the OS grid square containing the Installation are below the relevant standard for annual mean NO_2

The assessment of the Installation included the CCGT, the auxiliary boiler and the two JT heaters, all assessed under normal operations using detailed dispersion modelling.

The impacts on human health were assessed and the effects were found to be **insignificant** for the whole modelled grid domain for annual mean NO_2, hourly mean CO and the CO 8-hour rolling mean. The results for hourly mean NO_2 were found to be **insignificant** at the discrete human receptor locations.

The impacts on ecological receptors have been assessed and for annual mean NO_x, the results were found to be **insignificant** at all but one of the ecological receptors. At receptor E2 (Humber Estuary SAC), the effects could not be screened out using the EA criteria, however the PEC is below the CL and the impacts are therefore considered to **be not significant**. The contour plots indicate that the highest PCs occur over a small area where the existing background concentrations are high.

The impacts on ecological receptors for daily NO_x could not be screened out as insignificant for all receptors, however the PECs are all below the CL and are therefore considered to be **not significant**.

Nitrogen deposition and acid deposition can be screened out using the EA criteria, as the PC is less than 1% of the relevant CLds for all ecological receptors assessed, indicating the effect of the Installation on nitrogen deposition and acid deposition is **insignificant.**

The EDG is also assessed, via the SCAIL tool, under planned testing and maintenance operations as well as an emergency scenario. The results of the SCAIL assessment indicate that the effects of the planned testing and maintenance activities and the emergency scenario would be **insignificant** for all human and ecological receptors.

Overall, it can be concluded that there are no significant effects from the Installation on air quality.

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Annex A

SCAIL Methodology and Assessment

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A.1 SCAIL Methodology

The SCAIL combustion tool has been used to assess the potential for air quality impacts to occur as a result of the operation of the proposed EDG (Emission Point A3) to be installed as part of the Installation.

SCAIL is a screening tool that uses the atmospheric dispersion model AERMOD to predict impacts of emissions from small and medium combustion sources. The model estimates the impacts of emissions on sensitive habitat sites and can also be used to assess impacts at human receptors.

The final EDG has yet to be selected, however data available for the comparably sized EDGs has been used to carry out the assessment. Based on the fact that EDGs typically run for a maximum of 12 hours per year for testing it is unlikely that any substantial impacts will occur.

A.1.1 Receptors

For ecological receptors, the SCAIL tool determines relevant ecological receptors within a given radius dependent on the plant capacity and fuel type. For the proposed EDG a search radius of 2km was determined by the SCAIL tool.

The Humber Estuary SPA, SAC and SSSI and the North Killingholme Haven Pits were the only ecological receptors identified by the tool, at 0.5km to 0.8km from the EDG location. An additional LWS receptor was added to the tool (Chase Hill Wood), to represent the closest LWS site to the EDG, given the close proximity of a number of these sites to the Installation.

A human health receptor was also added to the SCAIL tool, in line with the closest receptor to the Installation identified for the main assessment.

The identified receptors included are detailed below in Table 7-1.

Table 7-1: Receptors Included in the SCAIL Tool

Receptor Name	Receptor Type	X	Y
Humber Estuary SAC	Ecological receptor - SAC	516532	420005
Humber Estuary SSSI	Ecological receptor - SSSI	516532	420005
Humber Estuary SPA	Ecological receptor - SPA	516258	419728
North Killingholme Haven Pits	Ecological receptor - SSSI	516258	419728
Chase Hill Woods	Ecological receptor – LWS	515513	419264
Residential property on Brick Lane (R4)	Human receptor – residential	514640	418825

A.1.2 Emission Parameters

The parameters outlined in Table 7-2 were used in the SCAIL tool for the EDG. Only emissions of NO_x have been included in the assessment, as the combustion of low sulphur gas oil is not anticipated to lead to significant emissions of SO_2 or particulates, which is why there are no emission limits applied for these pollutants from gas oil engines in the MCPD.

Exact data are not available at this stage, however conservative assumptions have been made for the parameters below based on professional judgement.

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Table 7-2: SCAIL Input Parameters for the EDG

Parameters	Data
Emission Point Reference	A5
Stack location	515752, 419688
Stack height (m)	20.0
Stack diameter (m)	0.4
Flues (No#)	1
Exhaust temp (°C)	470
Exhaust velocity (m/s)	58.8
Operating hours	12 hours (testing)/ 72 hours (emergency)
Plant capacity	1.5MWth
NO_x (g/s)	2.1

A.1.3   Meteorological Data

The SCAIL tool uses meteorological data from nearby weather stations and can be run in one of three modes.

The conservative mode uses the source to receptor bearing that will rotate the habitat site so that it is in the prevailing wind direction and hence receives the highest amount of pollutant concentrations.

The hybrid mode provides concentrations from the conservative method with an arc of +/- 40 to +/-10 at the receptor.

The realistic mode uses the actual position of the receptor and bearing to the source. It is most suitable for sources spread across a wide geographical area. It is not suitable for planning or permitting purposes.

In order to provide a conservative assessment, the conservative mode has been used to assess the impacts of the EDG, as it provided the highest predicted impacts when compared with the hybrid mode.

A.1.4   Assessment Scenarios

The SCAIL assessment was carried out for both a general maintenance and testing scenario for the EDG and for a potential emergency scenario.

The EDG is intended for emergency use only and as such will not be in continuous operation. It is only intended to undergo periodic testing for maintenance procedures. It is anticipated that the generator will operate for a maximum of 12 hours per year for testing.

There is no specific guidance for an emergency operating window for emergency generators. Best practice guidance has been drawn on from the data centre sector, whereby a 72-hour operating window is recommended to be used by the EA[19]. This provides a highly conservative assessment due to national grid reliability and in-built design resilience. For this assessment, a period of 72 hours has been used for the emergency scenario.

A.2   SCAIL Results

A.2.1   Human Health Receptor

The results for NO_2 for the testing and emergency scenarios are shown below in Table 7-3. The annual mean PC was less than 1% of the AQS objective for the testing scenario and therefore can be considered to be insignificant according to the EA screening criteria and therefore no further assessment is required.

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[19] Environment Agency, 2022. working draft BAT guidance document specifically for data centres: 'Data Centre FAQ Headline Approach v21' (November 2022)

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The hourly mean NO_2 PCs for the testing and emergency scenarios are both 0.1% and less than the hourly mean NO_2 AQS objective. The impacts are therefore below the screening threshold of 10% for short term impacts and can therefore be considered **insignificant.**

Table 7-3: SCAIL Results for Testing and Emergency Scenarios - NO_2 Impacts at Closest Human Receptor R4

AQS ($\mu g/m^3$)	NO_2 background ($\mu g/m^3$)	Testing Scenario				Emergency Scenario			
		PC ($\mu g/m^3$)	PC % of AQS	Screening	PEC ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC % of AQS	Screening conclusion	PEC ($\mu g/m^3$)
40	10.0	0.001	<0.1%	Insignificant	10.0	-*	-	-	-
200	19.9	0.006	<0.1%	Insignificant	19.9	0.04	<0.1%	Insignificant	20.0

The emergency scenario is only applicable to the hourly mean AQS objective as it is not a scheduled activity over the course of a year.

A.2.2   Ecological Receptors – NO_x Critical Levels

For the testing scenario, the PC is less than 1% of the CL for all receptors assessed, and therefore can be screened as **insignificant.**

The results are shown below in Table 7-4.

Table 7-4: NO_x Concentrations for the Ecological Receptors for the Testing Scenario

Receptor	Critical Level ($\mu g/m^3$)	Background concentration ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC % of Critical Level	PEC ($\mu g/m^3$)
Chase Hill Woods LWS		14.9	0.002	<0.1%	14.9
Humber Estuary SPA		18.0	0.002	<0.1%	18.0
North Killingholme Haven Pits SSSI	30	18.0	0.002	<0.1%	18.0
Humber Estuary SAC		32.0	0.001	<0.1%	32.0
Humber Estuary SSSI		32.0	0.001	<0.1%	32.0

The daily mean NO_x data is not available in the SCAIL tool, so the annual mean PCs and PECs have been compared to the AQS for the emergency scenario, although the emergency scenario is not a planned even that takes place throughout the year.

For the emergency scenario, the PC is less than 1% of the CL for all sites and therefore the impacts can be considered to be **insignificant.** The results are shown below in Table 7-5.

Table 7-5: NO_x Concentrations for the Ecological Receptors for the Emergency Scenario

Receptor	Critical Level ($\mu g/m^3$)	Background concentration ($\mu g/m^3$)	PC ($\mu g/m^3$)	PC % of Critical Level	PEC ($\mu g/m^3$)
Chase Hill Woods LWS		14.9	0.01	<0.1%	14.9
Humber Estuary SPA		18.0	0.01	<0.1%	18.0
North Killingholme Haven Pits SSSI	30	18.0	0.01	<0.1%	18.0
Humber Estuary SAC		32.0	0.01	<0.1%	32.0

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Receptor	Critical Level (µg/m³)	Background concentration (µg/m³)	PC (µg/m³)	PC % of Critical Level	PEC (µg/m³)
Humber Estuary SSSI		32.0	0.01	<0.1%	32.0

A.2.3   Ecological Receptors - Deposition Impacts

The results for nitrogen deposition for the testing scenario are shown in Table 7-6 and Table 7-7 shows the emergency scenario.

The PCs are less than 1% of the relevant critical loads at all receptors assessed for both nitrogen and acid deposition for both the testing and the emergency scenarios and therefore can be considered to be **insignificant.**

Table 7-6: Nitrogen and Acid deposition for the Testing Scenario

Receptor	N deposition (kg N/ha/yr)					Acid deposition (keq H/ha/yr)				
	PC	Background concentration	PEC	Critical Load	PC % of Critical Load	PC	Background concentration	PEC	Critical Load	PC % of Critical Load
Chase Hill Woods LWS	0.0005	31.2	31.2	10	<0.1%	0.0	2.5	2.5	2.7	<0.1%
Humber Estuary SPA	0.0003	16.6	16.6	5	<0.1%	0.0	1.4	1.4	0.5	<0.1%
North Killingholme Haven Pits SSSI	0.0003	16.6	16.6	10	<0.1%	0.0	1.4	1.4	-	<0.1%
Humber Estuary SAC	0.0002	16.7	16.7	5	<0.1%	0.0	1.4	1.4	4.9	<0.1%
Humber Estuary SSSI	0.0002	16.7	16.7	5	<0.1%	0.0	1.4	1.4	0.5	<0.1%

Table 7-7: Nitrogen and Acid Deposition for the Emergency Scenario

Receptor	N deposition (kg N/ha/yr)					Acid deposition (keq H/ha/yr)				
	PC	Background concentration	PEC	Critical Load	PC % of Critical Load	PC	Background concentration	PEC	Critical Load	PC % of Critical Load
Chase Hill Woods LWS	0.003	31.2	31.2	10	<0.1%	<0.1	2.5	2.5	2.7	<0.1%
Humber Estuary SPA	0.002	16.6	16.6	5	<0.1%	<0.1	1.4	1.4	0.5	<0.1%
North Killingholme Haven Pits SSSI	0.002	16.6	16.6	10	<0.1%	<0.1	1.4	1.4	N/A	<0.1%

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Receptor	N deposition (kg N/ha/yr)					Acid deposition (keq H/ha/yr)				
	PC	Background concentration	PEC	Critical Load	PC % of Critical Load	PC	Background concentration	PEC	Critical Load	PC % of Critical Load
Humber Estuary SAC	0.001	16.7	16.7	5	<0.1%	<0.1	1.4	1.4	4.9	<0.1%
Humber Estuary SSSI	0.001	16.7	16.7	5	<0.1%	<0.1	1.4	1.4	0.5	<0.1%

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A.3 Summary and Conclusions

A screening assessment has been undertaken using the SCAIL tool for the proposed EDG to be installed as part of the Installation for emergency use. The assessment has considered both testing and potential emergency scenarios.

Following the methodology set out in the EA's Risk Assessment guidance, the impact on human receptors is considered to be **insignificant**.

For ecological receptors, the results in terms of the CL and CLds can all be considered to be **insignificant**. The overall effect of the EDG in relation to air quality is therefore considered to be **insignificant**.

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Annex B - Model Sensitivity

The maximum PC of NO_2 at the worst-affected human health receptors and NO_x at the worst-affected statutory designated ecological receptor associated with the variable input parameters, are presented in Table 7-8 as the percentage of maximum reported values in Table 6-1 and Table 6-2 above.

The worst case year for the long-term averages was 2020 and the worst case year for short-term averages was 2024 across the modelled grid area. Both models have been run for the surface roughness either side of the original assessment (0.5m – 'Parkland, open suburbia'): 1.0m for 'Cities, woodlands' and 0.3m for 'Agricultural areas max'.

Table 7-8: Point Source Dispersion Model Sensitivity Analysis

Model Input Variable	Human Health Receptor – NO_2		Ecological Receptor NO_x	
	Short-term (2024)	**Long-term (2020)**	**Short-term (2023)**	**Long-term (2023)**
Reported Results ($\mu g/m^3$)	**7.3**	**0.3**	**28.1**	**1.0**
Meteorological data (5-year min-max)	92%	64%	57%	58%
Surface roughness representation (0.3m)	96%	79%	93%	84%
Surface roughness representation (1.0m)	99%	129%	143%	123%

The main uncertainty associated with the model is considered to be the meteorological data, with the lowest NO_2 process contribution resulting in a PC that is only 92% of the reported hourly mean NO_2 result at the worst-case human health receptor; this is equivalent to an overall uncertainty at the worst-affected receptor of -0.6$\mu g/m^3$ (or -0.3% of the relevant AQS objective).

The lowest annual average NO_2 process contribution was 64%, equivalent to an overall uncertainty at the worst-affected receptor of -0.4$\mu g/m^3$ (or -1.5% of the relevant AQS objective).

The surface roughness representation in the main model has been assessed at 0.5m, representative of 'Parkland, open suburbia'. This is consistent with modelling carried out for other projects in the area and is considered to be the most appropriate surface roughness for the site. The surface roughness has been varied and it was found that a higher surface roughness (1.0m), resulted in higher long-term impacts at the worst case receptors, with the lower surface roughness (0.3m) resulting in the lowest impacts throughout.

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Annex C – Full Human Health Receptor Results

Annual Average Human Health Impacts for NO2 at Receptors

Receptor	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	2nd Stage Screened as Insignificant?
R1		0.1	0.3%			13.1	32.8%	
R2		0.2	0.4%			13.2	32.9%	
R3		0.2	0.5%			13.2	33.0%	
R4		0.3	0.7%			13.3	33.2%	
R5		0.1	0.4%			13.1	32.9%	
R6		0.1	0.3%			13.1	32.8%	
R7		0.1	0.2%			13.1	32.7%	
R8		0.04	0.1%			13.0	32.6%	
R9	40	0.04	0.1%	Yes	13.0	13.0	32.6%	NA
R10		0.03	0.1%			13.0	32.6%	
R11		0.03	0.1%			13.0	32.6%	
R12		0.03	0.1%			13.0	32.6%	
R13		0.1	0.1%			13.1	32.6%	
R14		0.05	0.1%			13.0	32.6%	
R15		0.2	0.4%			13.2	32.9%	
R16		0.1	0.2%			13.1	32.7%	
R17		0.1	0.2%			13.1	32.7%	

Hourly Average Human Health Impacts for NO2 at Receptors

Receptor	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	PC/(AQS – 2 x BC)	2nd Stage Screened as Insignificant?
R1		3.6	1.8%			29.6	14.8%	2.1	
R2		3.7	1.9%			29.7	14.9%	2.1	
R3		4.7	2.3%			30.7	15.3%	2.7	
R4		6.9	3.4%			32.9	16.4%	4.0	
R5		4.6	2.3%			30.6	15.3%	2.6	
R6	200	4.8	2.4%	Yes	26.0	30.8	15.4%	2.7	Yes
R7		2.2	1.1%			28.2	14.1%	1.3	
R8		1.6	0.8%			27.6	13.8%	0.9	
R9		1.5	0.8%			27.5	13.8%	0.9	
R10		1.4	0.7%			27.4	13.7%	0.8	
R11		1.3	0.7%			27.3	13.7%	0.8	
R12		1.4	0.7%			27.4	13.7%	0.8	

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Receptor	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	PC/(AQS – 2 x BC)	2nd Stage Screened as Insignificant?
R13		2.2	1.1%			28.2	14.1%	1.2	
R14		1.9	1.0%			27.9	14.0%	1.1	
R15		2.0	1.0%			28.0	14.0%	1.2	
R16		1.9	0.9%			27.9	13.9%	1.1	
R17		1.6	0.8%			27.6	13.8%	0.9	

Hourly Average Human Health Impacts for CO at Receptors

Receptor	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	PC/(AQS – 2 x BC)	2nd Stage Screened as Insignificant?
R1		25.1	0.1%			447.9	1.5%	0.1%	
R2		26.7	0.1%			449.5	1.5%	0.1%	
R3		34.8	0.1%			457.6	1.5%	0.1%	
R4		48.3	0.2%			471.1	1.6%	0.2%	
R5		33.7	0.1%			456.5	1.5%	0.1%	
R6		34.6	0.1%			457.4	1.5%	0.1%	
R7		33.8	0.1%			456.6	1.5%	0.1%	
R8		22.0	0.1%			444.8	1.5%	0.1%	
R9	30,000	20.1	0.1%	Yes	422.8	442.9	1.5%	0.1%	Yes
R10		19.6	0.1%			442.4	1.5%	0.1%	
R11		21.0	0.1%			443.8	1.5%	0.1%	
R12		21.0	0.1%			443.8	1.5%	0.1%	
R13		26.1	0.1%			448.9	1.5%	0.1%	
R14		36.7	0.1%			459.5	1.5%	0.1%	
R15		24.5	0.1%			447.3	1.5%	0.1%	
R16		22.1	0.1%			444.9	1.5%	0.1%	
R17		18.2	0.1%			441.0	1.5%	0.1%	

8-Hour Rolling Average Human Health Impacts for CO at Receptors

Receptor	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	PC/(AQS – 2 x BC)	2nd Stage Screened as Insignificant?
R1		21.4	0.2%			444.2	4.4%	0.2%	
R2		23.2	0.2%			446.0	4.5%	0.2%	
R3	10,000	26.7	0.3%	Yes	422.8	449.5	4.5%	0.3%	Yes
R4		41.0	0.4%			463.8	4.6%	0.4%	
R5		25.1	0.3%			447.9	4.5%	0.3%	

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Receptor	AQS (µg/m³)	PC (µg/m³)	PC/AQS %	1st Stage Screened as Insignificant?	BC (µg/m³)	PEC (µg/m³)	PEC/AQS %	PC/(AQS – 2 x BC)	2nd Stage Screened as Insignificant?
R6		22.4	0.2%			445.2	4.5%	0.2%	
R7		12.6	0.1%			435.4	4.4%	0.1%	
R8		7.5	0.1%			430.3	4.3%	0.1%	
R9		6.3	0.1%			429.1	4.3%	0.1%	
R10		5.6	0.1%			428.4	4.3%	0.1%	
R11		5.6	0.1%			428.4	4.3%	0.1%	
R12		5.4	0.1%			428.2	4.3%	0.1%	
R13		10.8	0.1%			433.6	4.3%	0.1%	
R14		9.2	0.1%			432.0	4.3%	0.1%	
R15		7.1	0.1%			429.9	4.3%	0.1%	
R16		7.0	0.1%			429.8	4.3%	0.1%	
R17		6.4	0.1%			429.2	4.3%	0.1%	

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