NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning (Applications Prescribed Forms and Procedure) Regulations 2009

APFP Reg. 5(2)(a)

Infrastructure (Environmental Impact Assessment) Regulations 2017

North Lincolnshire Green Energy Park

Volume 6

Environmental Statement

6.2.5 Air Quality

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Acronyms and Abbreviations

Name	Description
ACC	Air Cooled Condensers
AGI	Above Ground Installation
APC	Air Pollution Control
APIS	Air Pollution Information System
AQAL	Air Quality Assesment Level
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
AQTAG	Air Quality Trends Analysis g=Group
As	Arsenic
AWL	Ancient Woodland
BAT	Best Available Techniques
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Society
BMVL	Best and Most Versatile Land
BREF	EU Best Available Techniques reference notes
C4SL	Category 4 Screening Levels
CBMP	Concrete Block Manufacturing Plant
CBR	California Bearing Ratio tests
Cd	Cadmium
CDM	Construction Design and Management
CHP	Combined Heat and Power
CIEH	Chartered Institute of Environmental Health
CIfA	Chartered Institute for Archaeologists
CIRIA	Construction Industry Research and Information Association
CLEA	Contaminated Land Exposure Assessment
Co	Cobalt
CO	Carbon Monoxide
CO2	Carbon Dioxide
CoCP	Code of Construction Practice
Cr	Chromium
CSM	Conceptual Site Model
Cu	Copper
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs

Name	Description
DfT	Department for Transport
DHN	District Heat Network
DHPWN	District Heat and Private Wire Network
dML	deemed Marine Licence
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
DoW:CoP	Definition of Waste: Code of Practice
DQRA	Detailed Quantitative Risk Assessment
EALs	Environmental Assessment Levels
EFT	Emission Factors for Transport
EIA	Environmental Impact Assessment
EMFs	Electric and Magnetic Fields
EPA	Environmental Protection Act
EPH	Extractable Petroleum Hydrocarbons
EPR	Environmental Permitting Regulations
EPUK	Environmental Protection UK
ERF	Energy Recovery Facility
ERM	Environmental Resources Management
ES	Environmental Statement
EU	European Union
EUS	Extensive Urban Survey
EV	Electric Vehicle
FGTr	Flue Gas Treatment residue
GAC	Generic Assessment Criteria
GI	Ground Investigation
GQRA	General Quantitative Risk Assessment
H2	Hydrogen
HCl	Hydrogen Chloride
HE	Historic England
HER	Historic Environment Record
HF	Hydrogen Fluoride
Hg	Mercury
HRA	Habitats Regulations Assessment
HHRA	Human Health Risk Assessment
HSE	Health and Safety Executive
IAQM	Institute of Air Quality Management
IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive

Name	Description
IPC	Integrated Pollution Control
IPPC	Integrated Pollution and Prevention Control
LAQM	Local Air Quality Management
LDF	Local Development Framework
LNR	Local Nature Reserves
LPA	Local Planning Authority
LQM	Land Quality Management
LWS	Local Wildlife Sites
M bgl	Metres below ground level
MCA	Mineral Consultation Area
MCAA	Marine and Coastal Access Act
MEA	Monoethanolamine
MHCLG	Ministry for Housing, Communities and Local Government
MMO	Marine Management Organisation
Mn	Manganese
MSA	Mineral Safeguarding Area
MWHe	Electrical generation in megawatt-hours (electric)
MWhth	Heat generation in megawatt-hours (thermal)
NDMA	N-Nitrosodimethylamine
NH3	Ammonia
NHLE	National Heritage List for England
Ni	Nickel
NLC	North Lincolnshire Council
NLGEP	North Lincolnshire Green Energy Park
NNR	National Nature Reserves
NO	Nitric Oxide
NO2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PA	Planning Act
PAC	Potential Area of Concern
PAH	Polycyclic Aromatics Hydrocarbons
Pb	Lead
PC	Process Contribution
PEC	Predicted Environmental Concentration
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate

Name	Description
pLWS	Potential Local Wildlife Site
PM	Particulate Matter
PPE	Personal Protective Equipment
PPG	Planning Practice Guidance
PRF	Plastic Recycling Facility
PV	Photovoltaic
PWN	Private Wire Network
QRA	Qualitative Risk Assessment
RDF	Refuse Derived Fuel
RHTF	Residue Handling and Treatment Facility
S21	Solar 21
S4UL	Suitable 4 Use Levels
SAC	Special Area of Conservation
Sb	Antimony
SGV	Soil Guideline Value
SI	Site Investigation
SO2	Sulpur Dioxide
SOCC	Statement of Community Consultation
SoS	Secretary of State
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TCM	Technology Centre Mongstad
TCPA	Town and Country Planning Act
TI	Thallium
TOC	Total Organic Carbon
UAD	Urban Archaeological Database
UK	United Kingdom
V	Vanadium
VOC	Volatile Organic Compounds
WFD	Waste Framework Directive
WMP	Waste Management Plan
WID	Waste Incineration Directives

1. INTRODUCTION

1.1 Overview

1.1.1.1 This chapter of the Environmental Statement (ES) presents the Air Quality Impact Assessment (AQIA) for the Project. The type, source and significance of potential effects are identified and the measures that will be employed to mitigate them are described.

1.1.1.2 In terms of the construction phase, impacts of dust and particulate matter $(PM)_{10}$ are assessed, along with emissions from construction traffic.

1.1.1.3 The Project comprises an Energy Recovery Facility (ERF) and associated development constituting thermal combustion combined with a heat and power plant. As part of the Project, a new railhead and upgrade to an existing 6km rail line and sidings, use of an existing wharf for shipping and a new access road to the Flixborough site are also of interest when assessing the impact on air quality in the area. Due to the complexity of the development, the air quality impact assessment includes a number of different sources that emit pollutants of interest. These include:

- The ERF including CO_2 capture facility;
- Back-up generator;
- District heating back-up boilers;
- Refuse Derived Fuel (RDF) delivery ships;
- RDF and aggregate delivery trains;
- Operational road traffic; and
- Residual material handling.

1.1.1.4 These sources were all included in the AQIA to allow for a comprehensive understanding of impacts, in particular emissions of oxides of nitrogen and potential impacts on nearby sensitive habitats. The AQIA thus provides inputs to the Human Health Risk Assessment (HHRA) (**Document Reference 6.2.17, Appendix B**), the ecological impact assessment (**Document Reference 6.2.10, Appendix A**) and the Report to inform the Habitats Regulations Assessment (HRA) (**Document Reference 5.9**) including the consideration of in-combination effects.

1.1.1.5 The pollutants of interest for the proposed facility are primarily those set out in the Industrial Emissions Directive 2010/75/EU (IED):

- Particulate matter (as PM_{10} and $PM_{2.5}$);
- Volatile Organic Compounds (VOC), expressed as total organic carbon (TOC);
- Hydrogen chloride (HCl);
- Hydrogen fluoride (HF);
- Sulphur dioxide (SO_2);
- Oxides of nitrogen (NOx), the sum of nitric oxide (NO) and nitrogen dioxide (NO_2), expressed as NO_2;

- Twelve metals: arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr) (as CrIII and CrVI), copper (Cu), mercury (Hg), manganese (Mn), nickel (Ni), lead (Pb), antimony (Sb), thallium (Tl) and vanadium (V);
- Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (collectively referred to as dioxins); and
- Carbon monoxide (CO).

1.1.1.6 In addition, emissions of ammonia (NH_3) and polycyclic aromatic hydrocarbons (PAH) will also be considered, for the following reasons.

- NH_3 is of interest in relation to effects on habitats, both directly and as a component of acid and nutrient nitrogen deposition; and
- PAH, as benzo[a]pyrene, is subject to a statutory air quality standard.

1.1.1.7 Consideration was also given to the emissions of amines, nitramines and nitrosamines (N-amines) during operation as a result of the proposed carbon capture system associated with the ERF plant.

1.1.1.8 In relation to effects on sensitive ecology, the potential impacts associated with emissions of NH_3, NO_X, SO_2 and HCl have been assessed for impacts on air quality directly and through deposition of acid and nutrient nitrogen. Predicted ground-level concentrations and derived deposition rates of these pollutants are compared with relevant air Critical Levels and Critical Loads for the protection of sensitive ecological receptors. The Study Area covers a 15km radius, in line with Environment Agency guidelines and the Natural England PEIR response. The cumulative effects assessment considers emissions from other developments within 15 km, plus a further 15 km from each SPA, SAC, Ramsar site and SSSI falling within the initial 15 km. The 'other developments' considered are those that are likely to include a significant combustion process.

1.1.1.9 Consideration is also made of the potential for emissions and impacts associated with odour from waste and dust from ash handling. Both of these are covered in limited detail as mitigation is readily applied to render impacts as negligible and therefore no detailed assessment is required.

1.1.1.10 Cumulative air quality effects on people are considered in Chapter 18 (**Document Reference 6.2.18**). Cumulative air quality effects on ecological receptors are considered in Chapter 18 (**Document Reference 6.2.18**).

2. POLICY CONTEXT, LEGISLATION, GUIDANCE AND STANDARDS

2.1 Summary

2.1.1.1 Air quality is regulated in England through multiple mechanisms. Ambient air quality standards are set for the protection of health throughout England, and these are legally binding. There are also Critical Levels and Critical Loads for the protection of habitats, and these too are legally binding. In addition, through the environmental permit issued by the Environment Agency, an industrial facility has set emission limits for those emission points deemed to be of potential significance in terms of their impacts on air quality. These emissions limits may be derived from Best Available Techniques Reference Notes (BREF Notes), from national guidance or set on a per facility basis. As part of the Permit process, a facility must demonstrate that the emissions to air from the facility will not result in unacceptable impacts. At the planning stage, a similar air quality impact assessment must also be undertaken that demonstrates that impacts will not be unacceptable; however, the criteria for determining this differ slightly from permitting. In practice, a facility must comply with both. This impact assessment takes into account the underlying environmental conditions in the surrounding environment to determine the overall air quality when the plant becomes operational.

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

2.2.1.1 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.

2.3 Air Quality Strategy for England, Scotland, Wales & Northern Ireland

2.3.1.1 The Government's policy on air quality within the UK is set out in the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland published in July 2007, pursuant to the requirements of Part IV of the Environment Act 1995. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK. The AQS is designed to be an evolving process that is monitored and regularly reviewed. The AQS sets standards and objectives for ten main air pollutants to protect health, vegetation and ecosystems.

2.4 Relevant Air Quality Regulations

2.4.1.1 Many of the objectives in the AQS were made statutory in England with *the Air Quality Standards (England) Regulations 2010* for the purpose of Local Air Quality Management (LAQM).

2.4.1.2 The Air Quality Standards (England) Regulations 2010 have adopted into UK law the limit values required by EU Directive 2008/50/EC. 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'.

2.4.1.3 The Environmental Assessment Levels (EALs), air quality standards and objectives for the pollutants considered in the assessment are presented in Section 2.9.

2.5 National Policy Statements

2.5.1.1 The National Policy Statements (NPSs) include references to air quality.

2.5.1.2 The Overarching Energy National Policy Statement (NPS EN-1) identifies key pollutants of concern for the protection of human health and ecosystems and states at paragraph 5.2.6 that the ES should describe:

- any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;
- the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;
- existing air quality levels and the relative change in air quality from existing levels; and
- any potential eutrophication impacts.

2.5.1.3 The National Policy Statement for Renewable Energy Infrastructure (EN-3) in paragraph 2.5.42 refers to the pollutants of concern arising from the combustion of waste and biomass to produce energy as including NOx, SOx, particulates and CO_2, with emissions of heavy metals, dioxins and furans also a consideration in assessing the effects of waste combustion.

2.5.1.4 As well as identifying key pollutants of concern, NPS EN-3 states at paragraph 2.5.43:

- "Where a proposed waste combustion generating station meets the requirements of Waste Incineration Directive (WID)[1] and will not exceed the local air quality standards, the Independent Planning Commission (IPC), now the Secretary of State, should not regard the proposed waste generating station as having adverse impacts on health."

2.5.1.5 On 6 September 2021, BEIS published for consultation a suite of five draft National Policy Statements to guide energy development proposals. The new NPSs were subject to consultation until the end of November. The House of Commons BEIS Committee reported on the Revised (Draft) National Policy Statement for Energy on 22nd February 2022, providing recommendations in relation to the suite of revised draft NPSs. The expectation is that the suite of revised NPSs will be designated by Summer 2022.

[1] It is noted that he WID has been superseded by the Industrial Emissions Directive and BREF, but is still referenced by EN-3

2.5.1.6 The draft NPS EN-1 reiterates the considerations contained in NPS EN-1 and does not introduce any additional policy considerations of relevance to assessing the effects of air quality impacts.

2.6 National Planning Policy Framework 2021

2.6.1.1 Chapter 15 of the National Planning Policy Framework (NPPF) (2021) notes that planning decisions should be:

> *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans …'*

2.6.1.2 In dealing specifically with air quality the NPPF states at Section 186 that:

> *'Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'*

2.7 Local Air Quality Policy and Air Quality Management

2.7.1 Local Air Quality Management (LAQM)

2.7.1.1 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.

2.7.1.2 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).

2.7.1.3 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.

2.7.1.4 The Department of Environment, Food and Rural Affairs (DEFRA) has published technical guidance for use by local authorities in their Review and Assessment work. This guidance, referred to in this chapter as LAQM TG (Technical Guidance) (16) , has been used where appropriate in the assessment.

2.7.2 Local Review and Assessment of Air Quality

2.7.2.1 North Lincolnshire Council has investigated air quality within its area as part of its responsibilities under the LAQM regime. An Air Quality Management Area (AQMA) has been declared in Scunthorpe. However, this AQMA is sufficiently distant from the Project as to not require consideration in the AQIA. The AQMA is also declared for PM_{10}. Impacts of PM_{10} from the Project on to the AQMA will be negligible given the low levels of PM_{10} emitted from the Project.

2.8 Guidance

2.8.1.1 The AQIA also takes into consideration the requirements of environmental permitting, noting that both a Development Consent Order (DCO) and an environmental permit are required to operate. As such the AQIA references several pieces of Environment Agency guidance and methodology. The AQIA has been undertaken with reference to applicable guidance documents. These include:

- Environment Agency (accessed April 2021) Air emissions risk assessment for your environmental permit;
- Environment Agency (2014) AQTAG06 Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air;
- Environment Agency (undated) Conversion Ratios for NOX and NO2;
- Environment Agency (2016) Releases from waste incinerators: Guidance on assessing group 3 metal stack emissions from incinerators; and
- Environment Agency (June 2021) Draft AQMAU recommendations for the assessment and regulation of impacts to air quality from amine-based post-combustion carbon capture plants.

2.8.1.2 The AQIA also references relevant planning guidance set out by the Institute of Air Quality Management (IAQM) with regards to determining the potential significance of impacts. Specifically;

- Institute of Air Quality Management (2017) Land-Use Planning & Development Control: Planning For Air Quality.

2.9 Air Quality Standards

2.9.1 Sensitive Human Receptors

2.9.1.1 The protection of sensitive human receptors is regulated through the following:

- Air Quality Standards imposed in UK law (2) transposed from EU standards (3); and
- Environmental Assessment Levels set out by the Environment Agency.

2.9.1.2 Collectively these are referred to as Air Quality standards (AQS). The AQSs of relevance for this assessment are set out in Table 1.

Table 1: Air Quality Standards

Pollutant	Averaging period	Assessment Criterion (µg/m^3)
PM_{10}	Annual mean	40
PM_{10}	24 hour mean (not to be exceeded more than 35 times per year)	50
$PM_{2.5}$	Annual mean	25
VOCs [1]	Annual Mean	5
VOCs [1]	1 hour mean	195
HCl	1 hour mean	750
HF	1 month mean	16
HF	1 hour mean	160
SO_2	24 hour mean (not to be exceeded more than 3 times per year)	125
SO_2	1 hour mean (not to be exceeded more than 24 times per year)	350
SO_2	15 minute mean (not to be exceeded more than 35 times per year)	266
NO_2	Annual mean	40
NO_2	1 hour mean (not to be exceeded more than 18 times per year)	200
As [2]	Annual mean	0.006
Cd	Annual mean	0.005
Cr III	Annual mean	5
Cr III	1 hour maximum	150
Cr VI [3]	Annual mean	0.00025
Cu	Annual mean	10
Cu	1 hour maximum	200
Hg	Annual mean	0.25
Hg	1 hour maximum	7.5
Mn	Annual mean	0.15
Mn	1 hour maximum	1500

(2) The Air Quality Standards Regulations 2010 Statutory Instrument 2008/301,

http://www.legislation.gov.uk/uksi/2010/1001/contents/made

(3) European Union Air Quality Standards

http://ec.europa.eu/environment/air/quality/standards.htm

Pollutant	Averaging period	Assessment Criterion (µg/m^3)
Ni	Annual mean	0.02
Tl	Annual mean	1
Tl	1 hour maximum	30
Pb	Annual mean	0.5
Sb	Annual mean	5
Sb	1 hour maximum	150
V	Annual mean	5
V	1 hour maximum	1
CO	8 hour running mean	10,000
CO	1 hour mean	30,000
NH_3	Annual mean	180
NH_3	1 hour maximum	2500
PAH [4]	Annual mean	0.001
MEA [5]	1 hour maximum	400
MEA [5]	24 hour maximum	100
NDMA [6]	Annual mean	0.0002

Note 1: Total VOCs assessed on the basis that all emissions arise as 100% benzene
Note 2: Note that the arsenic EAL used reflects the EAs EAL consultation[4], dated October 2020.
Note 3: assessed as CrVI in PM_{10}
Note 4: PAHs assessed on the basis that all emissions arise as 100% Benze[a]pyrene
Note 5: MEA EAL is used as a proxy for total amines
Note 6: NDMA EAL is used as a proxy for sum total N-amines
PCDD/F do not have an AQS as the total body burden is most critical and the large majority of exposure is via food.

2.9.2 Sensitive Ecological Receptors

2.9.2.1 The protection of sensitive ecological receptors is regulated through the following:

- Air Quality Standards imposed in UK law transposed from EU standards;
- Targets for protected conservation areas set out by the Environment Agency; and
- Site specific Critical Loads set out on the Air Pollution Information Service (APIS) website[5].

2.9.2.2 Those relating to ambient air are referred to as Critical Levels and those relating to deposition are referred to as Critical Loads (CLs).

2.9.2.3 The Critical Levels of relevance for this assessment are set out in Table 2.

[4] Environment Agency (October 2020) Using our 2012 methodology to derive new Environmental Assessment Levels for emissions to air Revision of 10 existing EALs and derivation of two new EALs
[5] UK Air Pollution Information System

2.9.2.4 As the CLs are site specific, these are set out in the detailed results in Appendix B.

Table 2: Critical Levels

Pollutant	Averaging period	Assessment Criterion (µg/m3)
NH_3	Annual mean	1 (lichens and bryophytes) 3 (other species)
SO_2	Annual mean	10 (lichens and bryophytes) 20 (other species)
NOx (as NO_2)	Annual mean	30
NOx (as NO_2)	24 hour mean	75
HF	1 week mean	0.5
HF	24 hour mean	5

3. CONSULTATION

3.1.1.1 Table 3 below presents an excerpt from the scoping response received from the Planning Inspectorate specific to the Air Quality assessment. Table 3 describes how each response has been or will be addressed by the Project.

Table 3: Scoping Consultation Responses

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
4.1.1	Proposed to be scoped out: Operational phase rail traffic beyond the site itself are scoped out.	Although the number of operational phase rail traffic movements during the operation of the Proposed Development have not been provided within the Scoping Report, the Inspectorate agrees in principle that rail traffic emissions during the operational phase are unlikely to result in significant effects to air quality beyond the site itself. However, the Applicant should include within the ES the number of operational phase rail traffic movements predicted during the operation and confirm that they are below the criteria for which an assessment would be required.	Emissions from the rail locomotive are included in AQIA. The site has capacity to receive up to four trains per day. However, on average there will be less accounting for holidays, bank holidays, Sundays etc and three trains have been assumed.	Section 4.10
4.1.2	Proposed to be scoped out: Shipping beyond the wharf	Although the number of shipping movements during the construction and operation of the Proposed Development have not been provided within the Scoping Report, the Inspectorate agrees in principle that shipping emissions during the operational phase are unlikely to result in significant effects to air quality beyond the site itself. However, the Applicant should include within the ES the number of shipping movements predicted during both the construction and operation of the Proposed Development and confirm that they are below the criteria for which as assessment would be required.	Ship emissions whilst on the wharfside are included in the AQIA for the operational phase, based on the assumption that a ship is at the wharf for 50% of the year, with the engine on 30% power to provide ship electricity.	Section 4.9

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
4.1.3	Proposed to be scoped out: Back-up generators and cold start engines	Insufficient information has been provided regarding the type of generator to be used, or whether the generator will require testing, and if so, how often the generator would be tested. On this basis, the Inspectorate does not agree that the impact to back-up generators and cold start engines can be scoped out of the ES.	The backup generator is tested for a 12 x 1 hour period in the year. These emissions are included in AQIA.	Section 4.8
4.1.4	Proposed to be scoped out: Cumulative effects on human receptors	Insufficient evidence has been provided within the Scoping Report to support the assumption that no air quality cumulative effects on human receptors will arise due to the Proposed Development. Therefore, the Inspectorate does not agree that this matter can be scoped out of the ES.	Cumulative impacts on human receptors with other projects are included in AQIA.	Chapter 18, Cumulative Effects Assessment (**Document Reference 6.2.18**)
4.1.5	Assessment of potential impacts on ecological receptors	The assessment should assess potential impacts on ecological sites, including the adjacent Humber Estuary SSSI, SAC and Ramsar. Appropriate cross-reference should be made to the Ecology and Nature Conservation aspect chapter of the ES. The assessment of potential air quality impacts on ecological receptors should take into account relevant technical standards, such as the Institute of Air Quality Management (IAQM) guide to the assessment of air quality impacts on designated nature conservation sites (IAQM, May 2020). Consideration should be given to all relevant pollutants including acid and nutrient nitrogen deposition.	Impacts on sensitive ecological receptors are included in AQIA for all relevant pollutants and potential impacts (the effects are assessed in Chapter 10, Ecology and Nature Conservation, **Document Reference 6.2.10**, and the report to inform HRA, **Document Reference 5.9**).	Section 4.13

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
4.1.6	Sensitive receptors	No receptors sensitive to air quality changes have been identified within the Scoping Report. The ES should clearly set out the type and quantity of both human and ecological receptors that could be affected and identify their locations by reference to a figure(s). The Applicant should make effort to agree on the receptors to be included in the impact assessment with the relevant statutory consultation bodies.	Discrete human sensitive receptors have not been included for modelling other than traffic. The worst case approach has been taken whereby effects on humans are assessed against the maximum off-site impacts. Where these worst case impacts are negligible, then no more detailed assessment of specific human receptors has been deemed necessary. Discrete sensitive ecological receptors have been identified based on Environment Agency guidance for appropriate study area distance, and the impacts at these are detailed in the AQIA.	Section 6.1 and Section 6.2
4.1.7	Baseline Monitoring	No baseline air quality monitoring is stated to be undertaken prior to the construction of the Proposed Development. If this approach is to be followed, the ES should provide a robust baseline for the purposes of the assessment through the use of specific air quality monitoring to establish baseline conditions for all relevant air pollutants associated with the construction and operation of the Proposed Development. The air quality baseline within the ES should accurately represent the entirety of the study area and extend to cover the full extent of potential impacts. The baseline data relied upon in the ES and for the purposes of the assessment should be relevant, up-to-date, and comprehensive. The ES should also detail the scope of the monitoring at the Proposed Development during construction and operation, together with any measures that	Baseline derived from publicly available air quality data has been captured and utilised in the AQIA. These data are, to the greatest extent possible, representative of the local area. However, of note is that there is a paucity of data for some pollutants meaning that the baseline is taken from sites that are more distant but considered representative, as is normal practice in AQIA. During construction phase, site boundary monitoring for PM_{10} will be undertaken. During operations, monitoring of N-amines will be undertaken. The overall design of the facility is designed to mitigate impacts to achieve acceptable impacts on air quality. These are set out here as required.	Section 6

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
		will be in place to avoid or reduce adverse air quality effects.		
4.1.8	Study Areas	The air quality assessment study area for the Proposed Development should include all receptors where significant effects are likely to occur. The ES should provide justification as to why the chosen study areas are appropriate, and the Applicant should make effort to agree on the study areas with the relevant consultation bodies. The ES should also include a figure(s) that depict the study area, air quality monitoring sites used to inform the assessment and sensitive receptors considered.	A 10km radius is defined for the study area based on Environment Agency guidance.	
4.1.9	Impacts from construction and operational traffic	When setting out the technical scope and approach for the air quality impact assessment in section 6.7 of the Scoping Report the Applicant states that 'Detailed modelling is not anticipated' for both impacts from construction and operational traffic. The Inspectorate considers that there is currently insufficient evidence provided within the Scoping Report with regards to the likely vehicle movements associated with the Proposed Development to support this statement. The need for an air quality assessment should be informed by the Transport Assessment and the Transport and Traffic ES chapter, particularly with regards to the potential impact from vehicle movements during both construction and operation of the Proposed Development. An assessment of air quality impacts associated with traffic should be presented, which states where	For the construction phase, traffic numbers are sufficiently low to be screened out using IAQM guidance. Detailed traffic modelling has been undertaken for the operational phase to inform the total impacts of all the project elements particularly on habitats.	Section 8

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
		significant effects are likely to occur.		
4.1.10	Odour	The Applicant states that odour impacts will be assessed on a semi-quantitative basis. However, the Applicant does not provide information on how odour impacts will be assessed. The Inspectorate would expect to see a robust and fully justified odour assessment that quantifies the odour impact from the operation of the Proposed Development. The odour assessment should take into account relevant industry standard guidance, such as IAQM - Guidance on the assessment of odour for planning (2018).	Included in the AQIA. Odour is principally controlled through best practice design for the ERF which has negative pressure which draws potentially odorous air from the tipping hall through the process thus destroying odours. A specific odour assessment and odour management plan is not included as the design of the process is designed to sufficiently minimise odour generation. This along with other measures are detailed in the AQIA.	
4.1.11	Combined emissions – emissions sources acting cumulatively	The ES should consider the cumulative effect of all emissions sources at sensitive human and ecological receptors. For example, predictions from the point/area/ volume source dispersion model should be combined with predictions from the road traffic dispersion model such that the total contribution from the Project can be understood.	All relevant sources of emissions are included in AQIA and the cumulative effects are considered. These include the ERF itself, boilers, backup generator, ship emissions, rail emissions and road traffic.	Chapter 18 (**Document Reference 6.2.18**)
N/A	Modelling approach	Burton Upon Stather Parish Council response: The dispersion modelling should include modelling using the emission limits set out in the Waste Incineration Directive as being a more realistic case than the suggested existing base line air quality.	The impact assessment considers the following: The Process Contribution (PC), which is the impact of the plant emissions, and the baseline which is the existing air quality. The PC is added to the baseline and compared to the air quality standards, and based on this the significance of the impacts are determined. The Emission Limits in the Waste Incineration Directive are now out of date, and the lower emission limits in the Waste	Section 5

PINS ID	Issue	Inspectorate's comments	Response / Action	Reference within this document
			Incineration BAT Reference Note are used in the assessment.	
N/A	Emissions standards	Environment Agency response: We expect new incineration developments to comply with the environmental performance standards in https://www.gov.uk///system/uploads/attachment data//297004/geho0209bpio-e-e.pdf [Additional comments in the response referred to the requirements of the environmental permitting process]	The Project will be compliant with the requirements of the current waste incineration BREF.	Section 4
N/A	Air quality effects on ecology	Natural England Response: The assessment should take account of the risks of air pollution and how these can be managed or reduced. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be found on the Air Pollution Information System website . Further information on air pollution modelling and assessment can be found on the Environment Agency website.	The AQIA set out in the chapter and in the associated Ecology impact assessment contains a comprehensive assessment of impacts on habitats. Impacts include NOx, SO_2, ammonia, HCl, HF, nutrient nitrogen and acid deposition. Impacts are considered for SSSIs, SACs and SPAs within a 15km radius of the main ERF stack, and consider the site specific Critical Loads, Critical Levels and baseline conditions.	Chapter 10 (**Document Reference 6.2.10**)
N/A	Effects on human health	Public Health England response: [Multiple references to the need to assess air quality effects on human health]	A comprehensive Human Health Risk Assessment is provided alongside the air quality impact assessment. This quantifies the potential impacts to human health associated with emissions to air from the ERF.	Chapter 17 (**Document Reference 6.2.17**)

3.1.1.2 Table 4 below sets out the key stakeholder comments from the pre-application statutory consultation specific to air quality. The table describes how each response has been or will be addressed by the Project. Responses have been included when they are directly relevant to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the Infrastructure EIA Regulations 2017), have required a technical clarification and / or further impact assessment. The full set of responses is contained in the Consultation Report (**Document Reference: 7.1 Appendix I-1**). Please note that at the time of responding to consultee comments, reference will have been made to the HRA as Annex 5 to the ES, this has subsequently changed to Report to inform Habitats Regulations Assessment **(Document Reference 5.9)**.

3.1.1.3 The consultee types for the purposes of statutory consultation under the 2008 Act are as follows:

- s42(a) is with prescribed consultees;
- s42(b) is with local authorities;
- s44 is with consultees with an interest in land; and
- s47 is with the local community.

Table 4: Section 42 and Section 47 Consultation Responses on the PEIR

Consultee type	Consultee	Comment	Response / Action	Reference within this document
S42(a)	Environment Agency	You should not assume that a permit will automatically be forthcoming once planning permission has been granted and we would welcome discussions with you in respect of how this may, or may not, be incorporated into your Development Consent Order. Environmental permit: we provided information regarding the requirements for the project under the Environmental Permitting Regulations 2016 for plant operation. These comments remain valid and we would add the following: Ash is an incineration plant residue which is produced in the furnace or collected in the gas cleaning plant. The permit will prevent these two	This is noted. Further discussions will be undertaken with the Environment Agency with regards to permits required and how these can be secured.	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		types of ash being mixed and will contain conditions to ensure that there are no significant emissions from the site from the handling or treatment of the ash. When ash is sent for disposal or recovery, other waste legislation will apply and the operator will be responsible for using a registered waste carrier to transport the material to an appropriately licensed facility. During the permit's lifetime, we will routinely assess the operator's compliance with this 'duty of care'."		
S42(a)	Flixborough Parish Council	The new road and re-instating the railway will increase traffic movements and along with the energy plant itself will increase air pollution and noise pollution and light pollution.	Although the new road access will be used for deliveries to the site, the primary reason for the inclusion of the new road access is facilities for construction, worker access, and to create a new route for existing port traffic, allowing it to bypass the current bottleneck at Neap House. By reinstating the railway line and using the existing wharf infrastructure for the delivery of fuel to the project by ship and train, North Lincolnshire Green Energy Park Limited (the Applicant) is aiming to keep the change in traffic movements to a minimum. However, Chapter 13: Traffic and Transport of the ES (**Document Reference 6.2.13**) has considered all deliveries by road as a worst case, and found there to be no significant impact expected on the road network. As has been set out in Chapter 5: Air Quality, of the ES (**Document Reference 6.2.5**) and Chapter 7: Noise, of the ES (**Document Reference 6.2.7**)	Chapter 13 (**Document Reference 6.2.13**)

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			the effects of traffic and rail movements on noise and air quality impacts are also anticipated to be negligible. The lighting along the new access road will be developed in accordance with the Indicative Lighting Strategy in Annex 4 of the ES (**Document Reference 6.3.4**) , which aims to reduce light effects as much as possible. Although the new road access will be used for deliveries to the site, the primary reason for the inclusion of the new road access is facilities for construction, worker access, and to create a new route for existing port traffic, allowing it to bypass the current bottleneck at Neap House. By reinstating the railway line and using the existing wharf infrastructure for the delivery of fuel to the project by ship and train, the Applicant is aiming to keep the change in traffic movements to a minimum. However, Chapter 13 has considered all deliveries by road as a worst case, and found there to be no significant impact expected on the road network. As has been set out in Chapter 13, the effects of traffic and rail movements on noise and air quality impacts are also anticipated to be negligible. The lighting along the new access road will be developed in accordance with the proposed lighting strategy, which aims to reduce light effects as much as possible.	
S42(a)	Natural England	Chapter 5, paragraph 4.13.1.1 indicates that the effects on habitats within 10 km of the Energy	In the Preliminary Environmental Information Report (PEIR), the Habitats Regulations	Report to inform HRA

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		Recovery Facility (ERF) have been assessed. Both Appendix A and Annex 5 indicate that a 10 km radius from the Project was used. 'Project', in this instance, is assumed to refer to the Order Limits. It is therefore unclear what search radius has been used and this should be clarified.	Assessment (HRA) (**Document Reference 5.9**) identified all designated sites within 10 km of the point of the main flue stacks, given that this is the key emission point potentially impacting sensitive ecology. The air quality modelling was undertaken using a similar buffer of 10 km from the flue stacks. The search area has been extended to 15 km from the flue stacks for the ES (**Document Reference 6.0**).	(**Document Reference 5.9**)
S42(a)	Natural England	Annex 5 states that initial modelling indicates a negligible risk of significant effects beyond 10 km, and therefore screening to 15 km has not been undertaken for European sites. It should be noted that Natural England has not yet had sight of the results of the initial modelling, so we have not been able to refer to this in our response. However it is relevant that Thorne Moor SAC is located within 15 km of the Order Limits and is notified for H7120 Degraded raised bogs (still capable of natural regeneration). H7120 Degraded raised bogs are sensitive to nutrient nitrogen and acid deposition. Natural England therefore advises that screening up to a minimum of 15 km of the Order Limits should be undertaken. Due to the nature of the proposed development and habitat sensitivities, it may also be appropriate to consider Hatfield Moor SAC and Thorne and Hatfield Moors SPA.	As a result of this advice from Natural England, air quality modelling has been extended to include a buffer of 15 km from the flue stacks. We note the presence of Hatfield Moor Special Area of Conservation (SAC) just outside this buffer zone. However, Thorne Moor SAC and Thorne and Hatfield Moors Special Protection Area (SPA) are included within the 15 km search area and are considered in the assessment.	N / A
S42(a)	Natural England	Annex 5, paragraph 4.2.2.7 states that "no habitats or species of the European sites were found to be sensitive to acid deposition". Acid	Where ecological receptors within 15km of the Project have relevant site specific Critical Loads for Acid Deposition and Nutrient Nitrogen	Report to inform HRA

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		deposition has therefore been scoped out of the assessment. APIS indicates that several interest features of the SPA are sensitive to acid deposition and therefore this should be scoped into the assessment.	Deposition, as identified from the Air Pollution Information System (APIS), these have been included in the AQIA and fed into the Report to inform Habitats Regulations Assessments (HRA) (**Document Reference 5.9**). The Report to inform HRA acknowledges that a number of broad habitat types used by the SPA bird interest features are sensitive to acid deposition. However, APIS confirms that, for all relevant species, the bird species are not sensitive to any acidity impacts even if the broad habitat types are sensitive. Therefore, no qualifying interest features of the SPA were found to be sensitive to acid deposition.	(**Document Reference 5.9**)
S42(a)	Natural England	Water-based features at all sites in question have been scoped out as the nutrient nitrogen is thought to be influenced overwhelmingly by waterborne nutrient loadings and agricultural run-off rather than by deposition from the atmosphere. Natural England does not consider this suitable justification to scope out all aquatic features. Where a relevant environmental benchmark has been provided on APIS, these features should be assessed.	This is noted. It is confirmed that environmental benchmarks have been used where they are provided by APIS e.g. salt marsh communities. The SAC water-based features that have been scoped out are: mudflats and sandflats not covered by seawater at low tide, river lamprey and sea lamprey. There are no environmental benchmarks provided on APIS for these features. APIS notes that marine and river habitats don't tend to be sensitive to air pollution impacts or are dominated by other sources of inputs.	N / A
S42(a)	Natural England	Vascular plant assemblage and invertebrate assemblage, interest features of the Humber Estuary SSSI, have been scoped out because Critical Loads have not been provided on APIS. Where this is the case, and features are sensitive to nitrogen, Natural England advises that	Vascular plants and invertebrate assemblages have not been scoped out in the HRA, in [Annex 5 of the ES **(Document Reference 6.3)]**. As suggested, supporting SAC habitats have been used as a proxy where required.	Report to inform HRA (**Document Reference 5.9**)

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		supporting SAC habitats could be used as a proxy.		
S42(a)	Natural England	Sand dune habitats have also been scoped out of the assessment for all sites in question. Dune systems are one of the most sensitive habitats to air pollution and, within the Humber Estuary SAC and SSSI, are already exceeding critical loads. Chapter 5, Section 8.3 summarises the findings of the Air Quality Impact Assessment (AQIA) and concludes that there are likely to be exceedances in nitrogen and acid deposition at Humber Estuary SSSI, SAC and SPA. Section 8.3 clearly identifies potentially significant contributions for dune habitats and concludes that detailed assessment is therefore required. Natural England are concerned then that dune habitats have not been included in the detailed assessments summarised in Appendix A and Annex 5. Air quality impacts on sand dunes should be considered in further detail in the Appropriate Assessment.	The potential significant contributions for dune habitats identified in the Air Quality Impact Assessment (AQIA) in the PEIR were based on modelling that assumed all habitat types were located within 10 km of the ERF. In reality, this is not the case and the HRA – [Annex 5 of the ES (**Document Reference 6.3**)] takes the further step of looking at the specific habitat locations within each designated site. All of the sand dune habitats are located at least 45 km from the Project and, at this distance, effects on sand dunes as a result of air emissions will be negligible. Therefore, effects on sand dunes have been scoped out of the ES (**Document Reference 6.0**).	Report to inform HRA (**Document Reference 5.9**)
S42(a)	Public Health England	Clarity is needed in terms of the human receptors used with the AQIA. Chapter 5, Table 12 (Predicted Impacts – Human, Traffic) lists 4 receptors named H1, H2, H3, and H4. A description of these health receptors could not be found. However, it is noted In Appendix C Table 25 (Location of Sensitive Habitat Receptors) that the receptors are similarly labelled H1-H13 but also named. The similarity in labelling is confusing and it is recommended that there is clarity	For traffic impacts, the four discreet human sensitive receptors are detailed in Table 12 of Chapter 5: Air Quality of the ES (**Document Reference 6.2.5**). For the assessment of impacts on the wider human population, no discreet sensitive receptors were defined. Instead, the highest maximum off-site impact is considered. Human Receptors have been re-labelled R1-R4 to avoid confusion with the habitat receptors	Table 12

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		between different receptor types used within the assessments.		
S42(a)	Public Health England	The rail emission parameters used within AQIA model are detailed in Chapter 5, Appendix C (Table 20). It is unclear why only emissions of nitrogen dioxide have been considered when the rail line will be operated using diesel engines that will have a greater range of emissions. Similarly, the traffic model appears to only to provide predictions of nitrogen dioxide, whereas emissions of particulate matter (PM10 and PM2.5) would also be expected. All emissions should be considered within a combined assessment.	Rail locomotive and road traffic emissions are included for the assessment of cumulative project impacts on sensitive ecology, given the very close proximity to the Humber Estuary habitats. The impacts of the small number of rail movements on human health would typically have been scoped out (using guidance in Defra TG16) as would road traffic, using guidance from the Institute of Air Quality Management (IAQM). However, as rail and road sources have been modelled to capture cumulative impacts on ecology, nitrogen dioxide was included in the assessment of human impacts for completeness. As PM_{10} and $PM_{2.5}$ are not of interest for ecology, these were not modelled.	N / A
S42(a)	Public Health England	It is recommended that the AQIA should include an evaluation of the combined impact from all emission sources on short and long-term air quality (i.e. a combined assessment of the operational transport (road and rail) emissions, installation (stack and fugitive) emissions, and background emissions from nearby facilities and transport). Each component should not be assessed in isolation, and, for example, if detailed assessment of traffic emissions (road or rail) is screened out, their contribution to the installation's overall air quality impacts should be included.	To confirm, the approach used in the AQIA is combined, and includes the principal sources of emissions (flue stacks, rail, ship, back up generators, boilers and road traffic). The only deviation is in road traffic, where a separate road-specific model is required (ADMS Roads, rather than the ADMS 5 point source model). For road traffic, impacts were predicted at the four receptors close to the proposed new access road. The AQIA is presented in Chapter 5: Air Quality of the Environmental Statement (**Document Reference 6.2.5**).	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
S42(a)	Public Health England	Other The current submission does not consider any risks or impacts that might arise as a result of electric and magnetic fields associated with the connection of the facility to the national grid.	Electromagnetic fields are most relevant in the context of overhead lines and receptors being very nearby or directly beneath. For high-voltage underground cables, their physical protection means there is no electric field, only a magnetic one, largely limited to immediately above the cable. United Kingdom (UK) cables comply with the relevant exposure limits without any need to 'shield' a magnetic field.	N / A
S42(b)	North Lincolnshire Council	With regards to Section 4.6 it is unclear why more recent meteorological data has not been used and why a more local site such as Humberside Airport has not been utilised for this assessment. The wind roses presented in Appendix A do not demonstrate the dominant south westerly winds that would be expected at Flixborough.	Doncaster Airport is closer and considered to be more representative of the local situation, noting that Humberside will be impacted more heavily by the North Sea Coast. Meteorological data for 2014 – 2018 was used in the assessment. Data of this age will have been captured using contemporary weather equipment and is robust for the modelling. The use of 2014-2018 data was specifically maintained in Chapter 5: Air Quality of the ES **(Document Reference 6.2.5)** to provide consistency with works undertaken in 2019 for the Project, to allow continuity in Project design and assessment execution for the benefit of the regulatory process.	N / A
S42(b)	North Lincolnshire Council	Section 4.11.1.3 states that four discreet human receptors have been identified in close proximity to the new road for modelling purposes. A map should be included to show the position of these receptors.	Please see Figure 1a and Figure 1b in the Chapter 5: Air Quality of the ES **(Document Reference 6.2.5).** Figure 1a provides a wider context showing nearby settlemenst and residential areas. Figure 1b shows human receptors (and protected narure conservation areas) near to the new access road specifically.	Appendix A, Figure 1a and Figure 1b.

Consultee type	Consultee	Comment	Response / Action	Reference within this document
S42(b)	North Lincolnshire Council	The EHO agrees with the Planning Inspectorates comments at the scoping stage in relation to the identification of sensitive receptors. Human receptors that could be affected by the operation of the proposed development should be identified and included on relevant figures and predicted impact.	Impacts associated with road traffic are assessed at specific human receptors in line with current Defra guidance. However, for other emission sources, including the main flue stacks, the maximum off-site impacts are considered. This is in line with current Environment Agency guidance and ensures that any spatial uncertainty in the exact locations of the maximum impacts is captured. As such, for these impacts, assessing at discreet human receptors is not appropriate nor required.	N / A
S42(b)	North Lincolnshire Council	In the absence of robust and representative background concentrations, it is felt by this department that a project of this scale would have benefited from site specific monitoring for some of the pollutants.	Please see Chapter 5: Air Quality of the ES (**Document Reference 6.2.5)** which describes the baseline data used.	Section 6
S42(b)	North Lincolnshire Council	The AQIA makes no assessment of odour. This was raised in our previous comments and is also reiterated by the Planning Inspectorate as follows: “the Applicant does not provide information on how odour impacts will be assessed. The Inspectorate would expect to see a robust and fully justified odour assessment that quantifies the odour impact from the operation of the Proposed Development. The odour assessment should take into account relevant industry standard guidance, such as IAQM - Guidance on the assessment of odour for planning (2018)”. To state that the odour is principally controlled through best practice design is not satisfactory.	Please see section 4.3.14 of the Chapter 5: Air Quality of the ES **(Document Reference 6.2.5)**. There is no requirement to undertake an assessment in line with the IAQM guidance as there are no odour emissions. The principle of IAQM is to assess the potential for nuisance based on a range of factors, including odour source strength and proximity of receptors. As there is no odour source, the method cannot be applied.	Section 5.3.14

Consultee type	Consultee	Comment	Response / Action	Reference within this document
S47	Local Community	As before all the local villages will effected with the air pollution and building close to all the windmills will just help to push it toward the houses. The pollution the lorries will bring not alone busy roads that already get congested at certain areas, and you want people to cycle around this and breath in the lovely clean air and look at a eyesore of rubbish piled high,dont think so.	Burning RDF produces waste gases, as does any process involving burning whether it's an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled and monitored continuously. This maximises the effectiveness of the process of destroying potentially harmful substances, and maximises the efficiency of the energy recovery process which is what will be used to produce electricity, and heat for the district heating scheme. The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack. The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality these are principally that the plant must comply with legally binding emission limits, and before the plant is able to obtain a DCO and an environmental permit a comprehensive study must be undertaken to demonstrate that the overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA. This process is overseen by the local authority, central Government and the statutory regulator, the Environment Agency. In support of the DCO application and environmental permit, an AQIA is undertaken for	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			the ERF plant. The AQIA considers emissions from several sources including the ERF plant itself, back-up generators used occasionally to provide emergency power, and boilers that are used to provide heat for the DHPWN when an ERF line is shut for maintenance, trains, ships and road traffic. There are several steps in the process: ■ The emissions from each of the sources is calculated based upon the design, size, hours of use etc. This is called the emissions inventory. ■ The emissions inventory data is put into the dispersion model. This model is designed to predict how substances are emitted and how they disperse once in the atmosphere. ■ The results of the dispersion model are combined with the baseline air quality data and compared to air quality standards. ■ The significance of impacts is determined using the guidance from the Institute of Air Quality Management and the Environment Agency. ■ If needed, the emissions inventory can be amended and the model re-run. The main dispersion model used is ADMS, which is specifically designed to model stacks and point sources. This model was used for modelling all of the sources except road traffic, which used a similar model ADMS-Roads which is specifically designed to model traffic. The results of these models were combined in the AQIA assessment, which is presented in Chapter 5: Air Quality of the ES (**Document Reference 6.2.5).**	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			The model considers several factors in order to correctly model the dispersion and impacts: ■ The design of the ERF and the characteristics of the boilers, back-up generators, ship and rail locomotives. ■ The local topography is represented in the model, noting the presence of nearby ridgelines and river valley. ■ The local land use. ■ The local meteorology with multiple parameters obtained from nearby Doncaster Airport. ■ The potential effect of the wind turbines close to Flixborough. ■ The presence of the ERF plant buildings. Including all of these factors in the model maximises the representation of the local area and localised effects. This is important when considering the potential impacts on nearby villages, noting the relative height of the stacks to the height of the land at these villages The model, ADMS, has been extensively validated against field studies and wind tunnel studies, and has been used for many years for this type of assessment. The impacts associated with both construction and operational traffic have also been assessed. The construction of the ERF plant will generate only small amounts of traffic on the local road network. These traffic movements are below the thresholds where significant impacts could arise as set out by the Institute of Air Quality Management and are not significant.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			When operational, there will be some traffic generated bringing RDF to the plant. The impacts of this traffic have been modelled for the new access road, and existing properties near the road. Impacts are not significant. This will be helped by the fact that RDF will also be brought to site by rail and ship reducing road traffic compared to a similar facility that is only road linked.	
S47	Local Community	Previously on the exact same site there was a Council Composting Plant which processed compost and gave off a nasty odour in the surrounding area and after years of complaints about the odour omitted, it was finally relocated only to now have a proposed site that has the potential of omitting far worse odours than the small composting site.	The ERF uses RDF. Being derived from waste, RDF contains substances that can potentially produce odour. This process is the same as that which will result in the dustbins smelling and is due to the breakdown of organic material by bacteria and fungi. As the RDF has the potential to smell, the whole process is designed to eliminate the odour source and stop there being an odour problem off-site. Measures include: ■ RDF is baled, not loose waste. ■ RDF is shipped in sealed containers, not open wagons. ■ RDF is not stored outdoors. ■ Containers are taken directly into the Tipping Hall and only opened once inside the tipping hall. ■ The Tipping Hall is sealed and fitted with roller doors. ■ The air from the Tipping Hall is drawn through the plant where the combustion process destroys the substances that produce odour. The plant is also designed with three process lines. When undertaking routine maintenance one	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			line will be shut at a time so that waste isn't sitting for a protracted period on site.	
S47	Local Community	There is already a massive concern in nearby villages (Roxby/Winterton) who are suffering horrendous odours from the landfill site which is actually located further away from those villages than this Energy Park would be to Flixborough and surrounding villages.	The baled RDF is delivered in sealed containers. These containers are unloaded and taken directly into the Tipping Hall. Here the container is opened, and the baled RDF placed into the waste bunker ready for processing. The Tipping Hall is within a sealed building with shutter doors. Air from the Tipping Hall is drawn through the combustion process meaning that any odour from the RDF is taken through the process and destroyed. Burning RDF produces waste gases, as does any process involving burning whether it's an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled and monitored continuously. This maximises the effectiveness of the process of destroying potentially harmful substances and maximises the efficiency of the energy recovery process which is what will be used to produce electricity, and heat for the DHPWN. The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack.	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality, these are principally that the plant must comply with legally binding emission limits, and before the plant is able to get consent and an environmental permit, a comprehensive study must be undertaken to demonstrate that the overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA, which his presented in Chater 5: Air Quality of the ES (**Document Reference 6.2.5**). This process is overseen by the local authority, central Government and the statutory regulator, the Environment Agency. The ERF uses RDF. Being derived from waste, RDF contains substances that can potentially produce odour. This process is the same as that which will result in the dustbins smelling and is due to the breakdown of organic material by bacteria and fungi. As the RDF has the potential to smell, the whole process is designed to eliminate the odour source and stop there being an odour problem off-site. Measures include: ■ RDF is baled, not loose waste. ■ RDF is shipped in sealed containers, not open wagons. ■ RDF is not stored outdoors. ■ Containers are taken directly into the Tipping Hall and only opened once inside the Tipping Hall. ■ The Tipping Hall is sealed and fitted with roller doors.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ The air from the tipping hall is drawn through the plant where the combustion process destroys the substances that produce odour. The plant is also designed with three process lines. When undertaking routine maintenance one line will be shut at a time so that waste isn't sitting for a protracted period on site.	
S47	Local Community	Winds – the village of Flixborough is 50m above sea level and has prevailing Westerly winds. The planned footprint for the Energy Park would mean that any odours from the waste from shipping, rail, road would impact Flixborough directly, with Easterly winds would impact Amcotts, and South Westerly winds would impact Burton Upon Stather and Normanby where the popular local country park is located and encouraging visitors from all around the UK to visit.	Burning RDF produces waste gases, as does any process involving burning whether it's an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled and monitored continuously. This maximises the effectiveness of the process of destroying potentially harmful substances and maximises the efficiency of the energy recovery process which is what will be used to produce electricity, and heat for the district heating scheme. The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack. The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality, these are principally that the plant must comply with legally binding emission limits, and before the plant is able to get consent and an environmental permit, a comprehensive study must be undertaken to demonstrate that the	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA, which is presented in Chapter 5: Air Quality of the Environmental Statement (**Document Reference 6.2.5).** This process is overseen by the local authority, central Government and the statutory regulator, the Environment Agency. There are several steps in the process: ■ The emissions from each of the sources is calculated based upon the design, size, hours of use etc. This is called the emissions inventory. ■ The emissions inventory data is put into the dispersion model. This model is designed to predict how substances are emitted and how they disperse once in the atmosphere. ■ The results of the dispersion model are combined with the baseline air quality data and compared to air quality standards. ■ The significance of impacts is determined using the guidance from the Institute of Air Quality Management and the Environment Agency. ■ If needed, the emissions inventory can be amended and the model re-run. The main dispersion model used is ADMS, which is specifically designed to model stacks and point sources. This model was used for modelling all of the sources except road traffic, which used a similar model ADMS-Roads which is specifically designed to model traffic. The results of these models were combined in the assessment. The model considers several factors in order to correctly model the dispersion and impacts:	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ The design of the ERF and the characteristics of the boilers, back-up generators, ship and rail locomotives. ■ The local topography is represented in the model, noting the presence of nearby ridgelines and river valley. ■ The local land use. ■ The local meteorology with multiple parameters obtained from nearby Doncaster Airport. ■ The potential effect of the wind turbines close to Flixborough ■ The presence of the ERF plant buildings. Including all of these factors in the model maximises the representation of the local area and localised effects. This is important when considering the potential impacts on nearby villages, noting the relative height of the stacks to the height of the land at these villages The model, ADMS, has been extensively validated against field studies and wind tunnel studies, and has been used for many years for this type of assessment.	
S47	Local Community	Pollutants and Emissions – With the chimney proposed to be 85m high possibly, the village being elevated at 50m above sea level the villagers would need 100% guarantee that no harmful pollutants will enter the atmosphere and ultimately end up passing through our villages, analysis shows that fine particles from incinerators can spread over a distance of 10km. Incinerators can release tonnes of carbon dioxide gas (what will happen to the CO2 produced and	The Project meets the R1 energy efficiency criteria set out in the Waste Framework Directive 2008/98/C (WFD) to qualify as an energy recovery operation and is therefore an ERF rather than an incinerator. Burning RDF produces waste gases, as does any process involving burning whether it's an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		captured if the greenhouses never get built?). Other pollutants released from Incinerators include mercury, hydrochloric acid, dioxins, oxides of nitrogen, cadmium and lead, what guarantees do you have for the residents of the village that we will be completely safe and that there is no health risk to us if the Energy Park is approved.	and monitored continuously. This maximises the effectiveness of the process of destroying potentially harmful substances and maximises the efficiency of the energy recovery process which is what will be used to produce electricity, and heat for the DHPWN. The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack. The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality, these are principally that the plant must comply with legally binding emission limits, and before the plant is able to get consent and an environmental permit, a comprehensive study must be undertaken to demonstrate that the overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA which is presented in Chapter 5: Air Quality of the Environmental Statement **(Document Reference 6.2.5**). This process is overseen by the local authority, central Government and the statutory regulator, the Environment Agency. There are several steps in the process: ■ The emissions from each of the sources is calculated based upon the design, size, hours of use etc. This is called the emissions inventory.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ The emissions inventory data is put into the dispersion model. This model is designed to predict how substances are emitted and how they disperse once in the atmosphere. ■ The results of the dispersion model are combined with the baseline air quality data and compared to air quality standards. ■ The significance of impacts is determined using the guidance from the Institute of Air Quality Management and the Environment Agency. ■ If needed, the emissions inventory can be amended and the model re-run. The main dispersion model used is ADMS, which is specifically designed to model stacks and point sources. This model was used for modelling all of the sources except road traffic, which used a similar model ADMS-Roads which is specifically designed to model traffic. The results of these models were combined in the assessment. The model considers several factors in order to correctly model the dispersion and impacts: ■ The design of the ERF and the characteristics of the boilers, back-up generators, ship and rail locomotives. ■ The local topography is represented in the model, noting the presence of nearby ridgelines and river valley ■ The local land use. ■ The local meteorology with multiple parameters obtained from nearby Doncaster Airport. ■ The potential effect of the wind turbines close to Flixborough. ■ The presence of the ERF plant buildings	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			Including all of these factors in the model maximises the representation of the local area and localised effects. This is important when considering the potential impacts on nearby villages, noting the relative height of the stacks to the height of the land at these villages The model, ADMS, has been extensively validated against field studies and wind tunnel studies, and has been used for many years for this type of assessment. Any combustion process produces waste gases. These waste gases contain substances that might be harmful to human health (and the natural environment) if they occur in sufficiently high concentrations. In the case of the ERF plant, the emissions must comply with emission limits, as well as through the AQIA demonstrate that the plant designed is such that there are no unacceptable impacts on air quality. What constitutes an 'unacceptable impact' is defined by the Institute of Air Quality Management (IAQM) for the Planning Context, and the Environment Agency for the Permitting Context. In practice, the Project needs to comply with both sets of criteria. The significance of impacts is judged on the basis of the predicted impacts of the plant using dispersion modelling, and the existing baseline air quality. The AQIA has to demonstrate that the plant impacts constitute a small proportion of the relevant air quality standard. The exact proportion allowed depends to some extent on the baseline, with a smaller	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			proportion allowed where the baseline is close to or above the air quality standards. In terms of the substances that are assessed, 25 substances are considered in the Air Quality Impact Assessment. This suite of substances is derived from many decades of research into the emissions from this type of process to come to a pragmatic and practical list of those that need to be regulated. There are, of course, many substances that are not regulated. This is because many years of research has shown that they do not occur in the emissions from ERF plants in sufficient quantities to ever be of concern. Once such example is polychlorinated biphenyls (PCBs). PCBs were once a commonplace industrial chemical, but have not been used for many years. PCBs cannot be created in the plant, and are not present in the RDF in any significant amount and hence do not need to be considered. Public Health England (PHE) discuss the health risks of ERFs and similar plants and conclude: "PHE's risk assessment remains that modern, well run and regulated municipal waste incinerators are not a significant risk to public health. While it is not possible to rule out adverse health effects from these incinerators completely, any potential effect for people living close by is likely to be very small." The assessment presented assumes that a proportion of CO2 emissions from the ERF will be captured for use in horticulture. As no	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			greenhouses are confirmed in the current plans, the CO2 is assumed to be sold and transported to other sites for use in horticulture. In the future it may also be possible that captured CO2 could be sent to deep geological storage. The Applicant are members of Zero Carbon Humber (ZCH), which represents the Humber region in the East Coast Cluster partnership. It is the intention that this facility will join up with the proposed ZCH pipeline, which will transport the CO2 to the disused gas fields in the North Sea. This government-backed programme has just commenced its own DCO process and early options for the route of the pipeline pass very close to the Application Land.	
S47	Local Community	We have grave concerns that the proposed development will have smells ,noise and emissions from production emitting from the site. That will become a problem for air quality and health. This we know from the old SITA site which was on a much smaller scale which caused unnecessary short term and long term suffering for local residents, both mentally and physically. The SITA site was instructed to close for the above reasons. SO WHY AFTER THIS PRESEDENT HAS BEEN SET< SHOULD PLANNING PERMISSION BE GRANTED FOR SUCH A MUCH LARGER OPERATION?? AND YES SITA IN THEIR PRE PLANNING CONSULTAION REASSURED LOCAL RESIDENTS THERE WOULD BE NO SUCH	The baled RDF is delivered in sealed containers. These containers are unloaded and taken directly into the Tipping Hall. Here the container is opened, and the baled RDF placed into the waste bunker ready for processing. The Tipping Hall is within a sealed building with shutter doors. Air from the Tipping Hall is drawn through the combustion process meaning that any odour from the RDF is taken through the process and destroyed. Burning RDF produces waste gases, as does any process involving burning whether it's an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled and monitored continuously. This maximises the	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		ISSUES. BUT HISTORY STATES DIFFERENTLY.	effectiveness of the process of destroying potentially harmful substances and maximises the efficiency of the energy recovery process which is what will be used to produce electricity, and heat for the DHPWN. The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack. The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality, these are principally that the plant must comply with legally binding emission limits, and before the plant is able to get consent and an environmental permit, a comprehensive study must be undertaken to demonstrate that the overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA which is presented in Chapter 5: Air Quality of the Environmental Statement (**Document Reference 6.2.5).** This process is overseen by the local authority, central Government and the statutory regulator, the Environment Agency. There are several steps in the process: ■ The emissions from each of the sources is calculated based upon the design, size, hours of use etc. This is called the emissions inventory.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ The emissions inventory data is put into the dispersion model. This model is designed to predict how substances are emitted and how they disperse once in the atmosphere. ■ The results of the dispersion model are combined with the baseline air quality data and compared to air quality standards. ■ The significance of impacts is determined using the guidance from the Institute of Air Quality Management and the Environment Agency. ■ If needed, the emissions inventory can be amended and the model re-run. The main dispersion model used is ADMS, which is specifically designed to model stacks and point sources. This model was used for modelling all of the sources except road traffic, which used a similar model ADMS-Roads which is specifically designed to model traffic. The results of these models were combined in the assessment. The model considers several factors in order to correctly model the dispersion and impacts: ■ The design of the ERF and the characteristics of the boilers, back-up generators, ship and rail locomotives. ■ The local topography is represented in the model, noting the presence of nearby ridgelines and river valley. ■ The local land use. ■ The local meteorology with multiple parameters obtained from nearby Doncaster Airport. ■ The potential effect of the wind turbines close to Flixborough. ■ The presence of the ERF plant buildings.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			Including all of these factors in the model maximises the representation of the local area and localised effects. This is important when considering the potential impacts on nearby villages, noting the relative height of the stacks to the height of the land at these villages The model, ADMS, has been extensively validated against field studies and wind tunnel studies, and has been used for many years for this type of assessment. The construction of the ERF can impact on air quality due to the emissions of dust from the construction process. Many years of practical experience have demonstrated that with the proper controls in place, dust from this process can be sufficiently controlled so as to not cause problems for nearby properties. The AQIA determines the level of controls needed and during the construction process a CEMP is used to make sure that the right measures are in place. The ERF uses RDF. Being derived from waste, RDF contains substances that can potentially produce odour. This process is the same as that which will result in the dustbins smelling and is due to the breakdown of organic material by bacteria and fungi. As the RDF has the potential to smell, the whole process is designed to eliminate odour and stop there being an odour problem off-site. Measures include: ■ RDF is baled, not loose waste.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ RDF is shipped in sealed containers, not open wagons. ■ RDF is not stored outdoors. ■ Containers are taken directly into the Tipping Hall and only opened once inside the Tipping Hall. ■ The Tipping Hall is sealed and fitted with roller doors. ■ The air from the Tipping Hall is drawn through the plant where the combustion process destroys the substances that produce odour. The plant is also designed with three process lines. When undertaking routine maintenance one line will be shut at a time so that waste isn't sitting for a protracted period on site. Any combustion process produces waste gases. These waste gases contain substances that might be harmful to human health (and the natural environment) if they occur in sufficiently high concentrations. In the case of the ERF plant, the emissions must comply with emission limits and, through the AQIA, demonstrate that the plant design is such that there are no unacceptable impacts on air quality. What constitutes as an 'unacceptable impact' is defined by the Institute of Air Quality Management for the planning context, and the Environment Agency for the permitting context. In practice, the Project needs to comply with both sets of criteria. The significance of impacts is judged on the basis of the predicted impacts of the plant using dispersion modelling, and the existing baseline air quality. The AQIA has to demonstrate that the	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			plant impacts constitute a small proportion of the relevant air quality standard. The exact proportion allowed depends to some extent on the baseline, with a smaller proportion allowed where the baseline is close to or above the air quality standards. In terms of the substances that are assessed, 25 substances are considered in the AQIA. This suite of substances is derived from many decades of research into the emissions from this type of process to come to a pragmatic and practical list of those that need to be regulated. There are, of course, many substances that are not regulated. This is because many years of research has shown that they do not occur in the emissions from ERF plants in sufficient quantities to be of concern. Once such example is polychlorinated biphenyls (PCBs). PCBs were once a commonplace industrial chemical but have not been used for many years. PCBs cannot be created in the plant and are not present in the RDF in any significant amount and hence do not need to be considered. PHE discuss the health risks of ERFs and similar plants and conclude: “PHE’s risk assessment remains that modern, well run and regulated municipal waste incinerators are not a significant risk to public health. While it is not possible to rule out adverse health effects from these incinerators completely, any potential effect for people living close by is likely to be very small.”	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
S47	Local Community	Planning consent should not be granted as there are more negatives than positives for short term and more important long term futures for this area. Smells can`t be monitored prior to building, which is far too late for residents. but has been proven it be a major issue AFTER the Planning was granted for the SITA site to be built.	The ERF uses RDF. Being derived from waste, RDF contains substances that can potentially produce odour. This process is the same as that which will result in the dustbins smelling and is due to the breakdown of organic material by bacteria and fungi. As the RDF has the potential to smell, the whole process is designed to eliminate odour and stop there being an odour problem off-site. Measures include: ■ RDF is baled, not loose waste. ■ RDF is shipped in sealed containers, not open wagons. ■ RDF is not stored outdoors. ■ Containers are taken directly into the Tipping Hall and only opened once inside the Tipping Hall. ■ The Tipping Hall is sealed and fitted with roller doors. ■ The air from the Tipping Hall is drawn through the plant where the combustion process destroys the substances that produce odour. The plant is also designed with three process lines. When undertaking routine maintenance one line will be shut at a time so that waste isn't sitting for a protracted period on site.	N / A
S47	Local Community	We like in Burton, we already have to put up with the smell of refuse when the wind is blowing the wrong way and now you're planning to burn rubbish on our door step. We all know the quality is Scunthorpe's air is poor, that's why we moved to the village. Extremely concerned you will be putting our air quality at risk, reducing our quality	The baled RDF is delivered in sealed containers. These containers are unloaded and taken directly into the Tipping Hall. Here the container is opened, and the baled RDF placed into the waste bunker ready for processing. The Tipping Hall is within a sealed building with shutter doors. Air from the Tipping Hall is drawn	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
		of life with the smells and risking our health with unproven technology.	through the combustion process meaning that any odour from the RDF is taken through the process and destroyed. Burning RDF produces waste gases, as does any process involving burning whether it's an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled and monitored continuously. This maximises the effectiveness of the process of destroying potentially harmful substances and maximises the efficiency of the energy recovery process which is what will be used to produce electricity, and heat for the DHPWN. The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack. The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality, these are principally that the plant must comply with legally binding emission limits, and before the plant is able to get consent and an environmental permit, a comprehensive study must be undertaken to demonstrate that the overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA. This process is overseen by the local	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			authority, central Government and the statutory regulator, the Environment Agency. There are several steps in the process: ■ The emissions from each of the sources is calculated based upon the design, size, hours of use etc. This is called the emissions inventory. ■ The emissions inventory data is put into the dispersion model. This model is designed to predict how substances are emitted and how they disperse once in the atmosphere. ■ The results of the dispersion model are combined with the baseline air quality data and compared to air quality standards. ■ The significance of impacts is determined using the guidance from the Institute of Air Quality Management and the Environment Agency. ■ If needed, the emissions inventory can be amended and the model re-run. The main dispersion model used is ADMS, which is specifically designed to model stacks and point sources. This model was used for modelling all of the sources except road traffic, which used a similar model ADMS-Roads which is specifically designed to model traffic. The results of these models were combined in the assessment. The model considers several factors in order to correctly model the dispersion and impacts: ■ The design of the ERF and the characteristics of the boilers, back-up generators, ship and rail locomotives.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ The local topography is represented in the model, noting the presence of nearby ridgelines and river valley. ■ The local land use. ■ The local meteorology with multiple parameters obtained from nearby Doncaster Airport. ■ The potential effect of the wind turbines close to Flixborough. ■ The presence of the ERF plant buildings. Including all of these factors in the model maximises the representation of the local area and localised effects. This is important when considering the potential impacts on nearby villages, noting the relative height of the stacks to the height of the land at these villages The model, ADMS, has been extensively validated against field studies and wind tunnel studies, and has been used for many years for this type of assessment. The ERF uses RDF. Being derived from waste, RDF contains substances that can potentially produce odour. This process is the same as that which will result in the dustbins smelling and is due to the breakdown of organic material by bacteria and fungi. As the RDF has the potential to smell, the whole process is designed to eliminate odour and stop there being an odour problem off-site. Measures include: ■ RDF is baled, not loose waste. ■ RDF is shipped in sealed containers, not open wagons.	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			■ RDF is not stored outdoors. ■ Containers are taken directly into the Tipping Hall and only opened once inside the Tipping Hall. ■ The Tipping Hall is sealed and fitted with roller doors. ■ The air from the Tipping Hall is drawn through the plant where the combustion process destroys the substances that produce odour. The plant is also designed with three process lines. When undertaking routine maintenance one line will be shut at a time so that waste isn't sitting for a protracted period on site. Any combustion process produces waste gases. These waste gases contain substances that might be harmful to human health (and the natural environment) if they occur in sufficiently high concentrations. In the case of the ERF plant, the emissions must comply with emission limits and, through the AQIA, demonstrate that the plant design is such that there are no unacceptable impacts on air quality. What constitutes an 'unacceptable impact' is defined by the Institute of Air Quality Management for the planning context, and the Environment Agency for the permitting context. In practice, the Project needs to comply with both sets of criteria. The significance of impacts is judged on the basis of the predicted impacts of the plant using dispersion modelling, and the existing baseline air quality. The AQIA has to demonstrate that the plant impacts constitute a small proportion of the relevant air quality standard. The exact proportion	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			allowed depends to some extent on the baseline, with a smaller proportion allowed where the baseline is close to or above the air quality standards. In terms of the substances that are assessed, 25 substances are considered in the AQIA. This suite of substances is derived from many decades of research into the emissions from this type of process to come to a pragmatic and practical list of those that need to be regulated. There are, of course, many substances that are not regulated. This is because many years of research has shown that they do not occur in the emissions from ERF plants in sufficient quantities to ever be of concern. Once such example is polychlorinated biphenyls (PCBs). PCBs were once a commonplace industrial chemical but have not been used for many years. PCBs cannot be created in the plant, and are not present in the RDF in any significant amount and hence do not need to be considered. PHE discuss the health risks of ERFs and similar plants and conclude: “PHE’s risk assessment remains that modern, well run and regulated municipal waste incinerators are not a significant risk to public health. While it is not possible to rule out adverse health effects from these incinerators completely, any potential effect for people living close by is likely to be very small.” The local context is important in the AQIA. As noted above, there are many factors that are	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			included in the dispersion modelling to account for the characteristics of the local area. In addition, the local baseline air quality is also considered. The baseline air quality around the plant and at nearby villages is good, and for all of the substances of interest the baseline is well below the air quality standards. This reflects the absence of local sources of emissions for the large majority of substances. In some cases, such as nitrogen dioxide and particulate matter, there are sources (principally road traffic) but again, these are not high enough in the local area to be close to air quality standards. Air quality standards are exceeded in some areas of Scunthorpe. However, the plant is far enough away, and the impacts small enough, that the emissions are far below the concentrations that might be deemed significant in Scunthorpe. Likewise, Scunthorpe is far enough away from the local villages that emissions from the town do not have a substantial effect on the baseline air quality.	
S47	Local Community	Emissions from extra trains and HGV will be excessive and go totally against the local councils approach to improving air quality.	The use of trains and ships has benefits to air quality in the local area over purely truck-based operations at most similar facilities. This is because ships and trains have lower emissions per tonne of waste delivered and are also, in the main, further away from people who tend to live close to roads. The impacts associated with both construction and operational traffic have been assessed.	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			The construction of the ERF plant will generate only small amounts of traffic on the local road network. These traffic movements are below the thresholds where significant impacts could arise as set out by the Institute of Air Quality Management and are not significant. When operational, there will be some traffic generated bringing RDF to the plant. The impacts of this traffic have been modelled for the new access road, and existing properties near the road. Impacts are not significant. This will be helped by the fact that RDF will also be brought to site by rail and ship, reducing road traffic compared to a similar facility that is only road linked.	
S47	Local Community	I am not sure about the plastic recycling facility. How will you ensure hydrocarbons of CO2 are not released into the air?	The Plastic Recycling Facilty (PRF) will provide increased capacity in the UK to recycle plastics. This will help to increase the amount of plastic which is recycled, reducing the amount of new plastic produced from fossil fuels, such as oil. Without increased plastic recycling capacity in the UK, recyclable plastics will otherwise need to be exported to other countries for recycling (with the associated greenhouse gas emissions from transport) or disposed of by other means which do not realise the benefit of avoiding the need to produce new plastics oil or other fossil fuels. The PRF itself will utilise heat from the ERF, exploiting energy recovered from the RDF that might otherwise be wasted and avoiding the need to use fossil fuels, such as natural gas, to produce	N / A

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			heat. The recyclable plastics will arrive in trucks, by rail and by ship. The use of trains and ships has benefits to air quality in the local area over purely truck-based operations at most similar facilities. This is because ships and trains have lower emissions per tonne of waste delivered and are also, in the main, further away from people who tend to live close to roads. Burning RDF produces waste gases, as does any process involving burning whether its an open fire at home, a car engine or a natural wildfire. One of the advantages of the ERF process is that the combustion conditions can be carefully controlled and monitored continuously. This maximises the effectiveness of the process is destroying potentially harmful substances and maximises the efficiency of the energy recovery process which is what is used to produce electricity, and heat for the District Heat and Private Wire Network (DHPWN). The waste gases are passed through a series of filtration steps that remove the vast majority of potentially harmful substances. The products of these filtration are collected using a sealed system and taken off-site for safe disposal. The remaining gases are then released through the main stack. The ERF process is heavily regulated and must comply with a wide range of legal requirements. For air quality, these are principally that the plant must comply with legally binding emission limits, and before the plant is able to get consent and an	

Consultee type	Consultee	Comment	Response / Action	Reference within this document
			environmental permit, a comprehensive study must be undertaken to demonstrate that the overall design of the plant does not have an unacceptable impact on air quality. This is the AQIA, which is presented in Chapter 5: Air Quality of the Environmental Statement **(Document Reference 6.2.5)**. This process is overseen by the local authority, central Government and the statutory regulator, the Environment Agency. In support of the DCO application and environmental permit, an AQIA is undertaken for the ERF plant. The AQIA considers emissions from several sources including the ERF plant itself, back-up generators used occasionally to provide emergency power, boilers that are used to provide heat for the district heating scheme when an ERF line is shut for maintenance, trains, ships and road traffic. There are several steps in the process: ■ The emissions from each of the sources is calculated based upon the design, size, hours of use etc. This is called the emissions inventory. ■ The emissions inventory data is put into the dispersion model. This model is designed to predict how substances are emitted and how they disperse once in the atmosphere. ■ The results of the dispersion model are combined with the baseline air quality data and compared to air quality standards. ■ The significance of impacts is determined using the guidance from the Institute of Air	

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			Quality Management and the Environment Agency. ■ If needed, the emissions inventory can be amended and the model re-run. The main dispersion model used is ADMS, which is specifically designed to model stacks and point sources. This model was used for modelling all of the sources except road traffic, which used a similar model ADMS-Roads which is specifically designed to model traffic. The results of these models were combined in the assessment. The model considers several factors in order to correctly model the dispersion and impacts: ■ The design of the ERF and the characteristics of the boilers, back-up generators, ship and rail locomotives. ■ The local topography is represented in the model, noting the presence of nearby ridgelines and river valley. ■ The local land use. ■ The local meteorology with multiple parameters obtained from nearby Doncaster Airport. ■ The potential effect of the wind turbines close to Flixborough. ■ The presence of the ERF plant buildings. Including all of these factors in the model maximises the representation of the local area and localised effects. This is important when considering the potential impacts on nearby villages, noting the relative height of the stacks to the height of the land at these villages The model, ADMS, has been extensively validated against field studies and wind tunnel	

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			studies, and has been used for many years for this type of assessment.	

4. ASSESSMENT PARAMETERS

4.1 Construction Traffic Screening

4.1.1.1 The IAQM [6] and Defra [7] set out screening criteria for road traffic.. These criteria have been used to determine the potential for significant effects associated with the construction of the Project applying criteria for a project that is not within or adjacent to an AQMA. The IAQM criteria are used as an initial screening stage, followed by Defra criteria. Where both sets of criteria are met, a detailed assessment is required, firstly based on IAQM:

- Screen in where there is ahange in Heavy Goods Vehicles > 100 AADT;
- Screen in where there is a change in Light Duty Vehicle > 500 LDVs/Day.

Then, based on Defra:

- Existing Roads: screen in where total HGVs (baseline + project) >2,500 AADT;
- Existing Roads: screen in where total traffic (baseline + project) >10,000 AADT AND the increase in traffic >25% of the baseline;
- New Roads: screen in where total traffic on new road is >10,000 AADT.

4.2 Construction Dust Assessment

4.2.1.1 In principle, dust emissions can be mitigated to the point that effects are negligible[8]. The IAQM sets out a methodology for assessing the risk of significant impact associated with dust emissions, and the level of mitigation required to render impacts on air quality negligible and effects on receptors not significant. This methodology has been utilised to identify the dust mitigation required. This approach divides construction activities into the following dust emission sources for the new road and the ERF itself:

- demolition;
- earthworks;
- construction; and
- trackout (this is where mud and debris from a building site adhering to vehicles are deposited onto public highways).

4.2.1.2 The risk of dust effects (low, medium or high) is determined by the scale (magnitude) and nature of the works and the proximity of sensitive human and ecological receptors. The IAQM guidance recommends that an assessment be undertaken where there are sensitive human receptors:

- within 350 m of the Site boundary; or

[6] IAQM (2017) Land-Use Planning & Development Control: Planning For Air Quality

[7] Defra (2021) Local Air Quality Management Technical Guidance Note TG(16)

[8] IAQM (2014) Guidance on the assessment of dust from demolition and construction

- within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s).

4.2.1.3 An assessment should also be carried out where there are dust-sensitive ecological receptors:

- within 50 m of the Site boundary; or
- within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrance(s).

4.2.1.4 The magnitude of the dust impacts for each source is classified as Small, Medium or Large depending on the scale of the proposed works. Table 14 in Appendix C summarises the IAQM criteria to determine the magnitude of dust emissions. These criteria are used in combination with site-specific information and professional judgement.

4.3 Operation

4.3.1 Overview

4.3.1.1 The AQIA utilises detailed dispersion modelling to predict the potential impacts on air quality as a result of emissions from the process and associated transport. Two models have been used: ADMS-5 for point source emissions; and ADMS-Roads for road traffic sources. The results of these models are then combined to provide a comprehensive understanding of air quality impacts at sensitive receptors. Key steps include the following.

- Source terms have been established for point sources. These are based upon design information, vendor specifications and derived from relevant emission limits.
- One model has been prepared for the point sources. However, within the model the impacts of each component (ship, rail, backup boilers, back-up generator and ERF) have been separated out. A post-processing step has been undertaken to re-combine the impacts of these sources. This approach has been undertaken to facilitate the modelling process for the large number of pollutants of interest and to allow factors to be applied outside the model (including hours of operation, loading and NOx to NO_2 conversion). This allows more flexibility in the modelling process and simplifies the technical review process should PINS, the Environment Agency or other stakeholders wish to scrutinise the modelling and assessment process.
- For the purposes of the air quality impact assessment each emission point is modelled as a separate emission point (i.e. seven in total). The presence of a windshield around the three main ERF flues (as assessed for landscape and visual impacts (see ES Chapter 11 Landscape and Visual Impact, **Document Reference 6.2.11**) does not influence the overall dispersion. Similarly small variations in flue separation distances of a few metres do not influence the outcome of the dispersion modelling. On this basis, any minor variations to the configuration and orientation of the flues in the main ERF stack and the presence of a windshield do not materially influence the outcome of the impact assessment.

- A separate model has been undertaken for N-amines from the ERF stack, including complex atmospheric chemistry. The model methodology for amines requires a conceptualised model approach, due to the complexity of the amines model.
- A separate model has been undertaken for road traffic emissions.

4.3.1.2 Six sources have been considered in the modelling, these are:

- The ERF:
  - assumed that all 3 lines operate year round.
  - assumed that all 3 lines operate on full load.
  - assumed to emit at BREF emission limits. However, the metals emissions are subject to a further assessment step using EA guidance to avoid overestimation of metals impacts.
- Back-up generator:
  - Operates for 12 x 1 hour periods per year for the purposes of testing.
- ERF back-up boilers:
  - assumed to operate 876 hours per year, as these are only used when the ERF plant is offline.
  - assumed to operate on full load.
- RDF delivery ship:
  - assumed to operate year round.
  - assumed to be present on the wharfside for 50% of the year.
  - assumed that the engine is running at 30% of full power when at the wharfside to provide ship electrical power.
  - no assessment made of emissions whilst travelling to and from the wharf, as this is a transient source.
- RDF and aggregate delivery trains:
  - assumed to operate year round.
  - three trains per day on average with one Class 66 locomotive.
  - assessment includes 1.33km of track including the sidings to assess cumulative impacts.
  - impacts along the branch from Flixborough to the mainline are not assessed as this is a transient source.
- Operational road traffic:
  - assumed to operate year round.
  - assumed to use the new road layout.
  - modelling of ERF associated vehicles on the new access road.

4.3.1.3 The key data for the overall model approach, and key input data for each source type is summarised in Table 15 in Appendix C.

4.3.2 Building Downwash / Entrainment

4.3.2.1 The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called downwash. In the Main ERF Stack model, 5 buildings were included in this assessment. Building locations and attributes are shown in Figure 2 in Appendix A and Table 16 in Appendix C.

4.3.3 Nitric Oxide to NO_2 Conversion

4.3.3.1 Oxides of nitrogen (NO_x) emitted to the atmosphere as a result of combustion will consist of nitric oxide (NO) ~90-95% and NO_2, with NO_2 being of interest to human health. 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).

4.3.3.2 The Environment Agency provide conversion ratios for the calculation of NO_x to NO_2. These are 70% for the long-term and 35% for short term.

4.3.4 Local Meteorological Data

4.3.4.1 The dispersion modelling has been carried out using five years (2014-2018) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. The worst case of the five years is used in the impact assessment. Data from a meteorological station at Doncaster Airport (approximately 23 km southwest of the Site) has been used for the assessment, which is the most representative data currently available for the area.

4.3.4.2 The effect on emissions of six local wind turbines (located ~1km to the north of the ERF) are included in the Main ERF , Backup Generator and Backup Boilers stacks models. The power, thrust, height and location data is included in the model. This data is shown in Table 17 in Appendix C.

4.3.4.3 Wind roses for each year of meteorological data are presented in Figure 3 in Appendix A.

4.3.5 ERF Main Stack Model

4.3.5.1 The input parameters used in the assessment of the Main ERF Stack are identified in Table 18 in Appendix C, using a stack height of 120m. Emission concentrations are based upon the emission limits set out in the Waste Incineration BREF Note[9]. For the metals species, the BREF emission limit has been factored using the 'mean' factor from the Environment Agency metals guidance to obtain representative emissions [10]. Main ERF stack emissions data were provided by Fichtner and includes the effect of carbon capture. The emissions of amines from the flues are based upon predicted emissions utilising data from other existing CCS plants where direct measurements have been obtained.

[9] European Commission (2019) Best Available Techniques (BAT) Reference Document for Waste Incineration

[10] Environment Agency (2016) Releases from Waste Incinerators: Guidance on assessing group 3 metal stack emissions from incinerators

4.3.5.2 The landscape and visual impact assessment considered a 120 m stack height as a worst case for landscape and visual impacts (see ES Chapter 11 Landscape and Visual Impact, **Document Reference 6.2.11**). The reference point for the stack height in the landscape and visual impact assessment was finished ground level as advised from the results of the Flood Risk Assessment. Finished ground level is 6.6 m AOD. For the dispersion modelling undertaken for the air quality impact assessment, the stack height was taken as a height of 120 m above the existing ground level at the ERF location. The model included a terrain file that set the height of the ground above sea level for the plant and the wider study area. The model then applied the heights of the stack and plant buildings onto the defined topography. Existing ground level at the location of the ERF is 4 m AOD. As a result the stack height for the air quality modelling is approximately 2.6 m less than that used for the landscape and visual impact assessment. A maximum ERF stack height of 120 m above finished ground level is committed to by the Project as this is the worst case for landscape and visual impact assessment. The assessment presented in this chapter shows that a slightly lesser stack height of 120 m above existing ground level is of sufficient height to meet the requirements of the air quality impact assessment in terms of no significant effects. Air dispersion modelling of a stack height of 120 m above finished ground level would show marginally improved dispersion and maginally lower pollutant concentrations at receptors; however, any differences would not be material in impact assessment terms and woud not alter the conclusions of the assessment.

4.3.5.3 There is the possibility of considering a lower height for the main stack than that considered in this air quality impact assessment, and stack height sensitivity will be undertaken as part of the Environmental Permitting process in accordance with the requirements of the Environment Agency under the Environmental Permitting (England and Wales) Regulations 2016.

4.3.6 Back-Up Generator Model

4.3.6.1 The input parameters used in the assessment of the Back-up Generator are identified in Table 19 in Appendix C. The emissions data are based upon potential vendor specifications.

4.3.7 Backup Boilers Model

4.3.7.1 The input parameters used in the assessment of the backup boilers are identified in Table 20 in Appendix C. The emissions data are based upon potential vendor specifications.

4.3.8 Ship Model

4.3.8.1 The input parameters used in the assessment of the vessels at Flixborough Wharf are identified in Table 21 in Appendix C. The emissions data are based upon the specification of the vessel that will be shipping RDF to site:

- Information on the engine capacity and approximate dimensions of the vessel were used to derive representative NO_x emissions based on the ship engine capacity and assuming that, as a worst case, the ship meets United States Environmental Protection Agency Tier 1 emission

factors (USEPA factors were used for ease of converting to a source term. USEPA and UK European emission factors are laragely comparable, and in practice engines are typicaly manufactured to be compliant with all applicable standards).

- Exit velocity, flue diameter and emission temperature were not available for the ship. These are therefore based upon a typical diesel engine.
- Stack height was estimated based upon photographs of the ship. However, of note is that this will, in practice, vary compared to the surrounding landscape depending upon the height of the tide. This factor has not been taken into account, and the approach used represents a reasonable worst case.

4.3.9 Rail Model

4.3.9.1 The input parameters used in the assessment of the Railhead are identified in Table 22 in Appendix C. RDF will be delivered to site on a train utilising 1 locomotive, and 3 trains per day are proposed:

- Information on the engine emissions is based upon a Class 66 locomotive[11].
- Emissions calculated from Strategic Rail Authority emissions factors for Class 66 engine, assuming emissions over a length of rail of 1.33km[12].
- Exit velocity, flue diameter and emission temperature were not available for the locomotive. These are therefore based upon a typical diesel engine.
- Stack height is based upon the dimensions of the locomotive.

4.3.9.2 The model was set up with 200 point sources to represent the rail line. The coordinates of these point sources are set out Table 18 in Appendix C.

4.3.10 Traffic

4.3.10.1 An initial traffic impact assessment has been undertaken, based solely upon operational ERF traffic. A new road is proposed to be constructed between the A1077 and Flixborough, bypassing Neap House. This does not include any existing traffic, or future other traffic on the new road. The input parameters used in the assessment of the new road are identified in Table 24 in Appendix C.

4.3.10.2 Emission factors were calculated in the model from the speed and number of vehicles using the Emission Factors for Transport (EFT) v9.0 dataset (2 VC) for the year 2027 and England (rural) type roads. Road vertices were obtained using GIS and shown in Table 25 in Appendix C.

4.3.10.3 The following are noted in the traffic model:

[11] Strategic Rail Authority (2001) Rail and Road Emissions Model

[12] Strategic Rail Authority Rail and Road Emissions Model (2001)
https://webarchive.nationalarchives.gov.uk/20081107010918/http://www.dft.gov.uk/pgr/rail/researchtech/research/railemissionmodel

- Associated with the Project is the construction of a new road to the south of the site, bypassing Neap House. As this road does not currently exist, the model is based upon the future emissions only and does not include the benefits to air quality of removal of traffic on the access road past Neap House. This road is principally modelled to include the traffic emissions in the assessment of impacts on the nearby Humber Estuary habitats as these need to be considered along with the point sources, rail and ship emissions associated with the Project.
- The new access road is the sole road modelled. Traffic changes on other roads are not sufficient to have a material impact on air quality. The key thresholds as set by Defra in Technical Guidance TG(16) is that impacts to air quality will not be significant on roads with AADT total traffic <10,000 vehicles/day and AADT HGV <2,500 vehicles/day; furthermore, the Institute of Air Quality Management [13] also set out that impacts to Human or Ecological receptors will not be significant where HGVs are less than 100 vehicles/day. Therefore the impacts associated with the Project can be screened out.
- The roads model includes the ERF traffic only.
- The model grid used for the point source emissions was used for the roads model sensitive ecological receptors. Four discrete receptors were used for the assessment of impacts at sensitive human receptors.
- The road model is based upon an opening year of 2027.
- Road width and speed are assumed, as these parameters are not specified at this point.
- The project will have a hydrogen filling station for HGV traffic. The air quality model utilises traffic data derived for the scenario without the hydrogen filling station, as this would mean that all HGV traffic is diesel fuelled with associated emissions of NO_x and PM_{10}. Hydrogen HGVs do not produce these pollutants as hydrogen fuel cells are zero emission. This differs from the Traffic Assessment which utilises a scenario with the hydrogen filling station as this generates the greatest number of HGVs which is the principal concern of the TA. In light of this the worst case assessment scenarios for air quality and the traffic asessment are different.

4.3.10.4 For the traffic modelling, four discrete human receptors have been identified proximal to the new road (see Figure 1b). Impacts have been assessed at these receptors. This does not include the benefits to air quality due to the closure of existing roads which will be of particular interest to Neap House. The receptors considered are:

- R1: Neap House, East: 486175, North: 413295.
- R2: Neap House Farm, East: 486125, North: 413215.
- R3: Park Ings Farm, East: 487150, North 414030.

[13] Institute of Air Quality Management (2017) Guidance on land-use planning and development control: Planning for air quality v1.2

- R4: Flixborough Stather, East: 486315, North 414095.

4.3.11 Amines Model

4.3.11.1 The operation of the carbon capture plant will result in the emission to air of N-amines. The following are noted in the amines model:

- The amines model uses the same base model as the main ERF stack model.
- The ADMS-5 chemistry module is enabled to simulate the atmospheric chemistry for the generation of N-amines.
- The amines chemistry module can only be used for one source. Therefore, the three flues are combined into one 'effective' stack.
- The amines model is based upon Monoethanolamine (MEA).

4.3.11.2 The amines model-specific data are set out in Table 26 in Appendix C.

4.3.11.3 The amine model runs include a time-dependent component. As such, under some circumstances this can lead to exceptionally long calculation times and very small concentrations that can result in the model failing to complete. A smaller, lower resolution grid was used to minimise these model-specific issues, however it is noted that the results presented are based upon the two out of five models that completed successfully. The predicted impacts are of sufficiently small scale (<1% of the EAL) that the use of the smaller grid, and use of 2 years of meteorological data does not have a bearing on the validity of the results when drawing conclusions relating to N-amines.

4.3.12 Habitats Assessments

4.3.12.1 Following Environment Agency guidance, effects on habitats within 15km of the ERF have been assessed. Effects have been assessed at the following sites within 15km of the ERF:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive;
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive; and
- Sites of Special Scientific Interest (SSSI) established by the 1981 Wildlife and Countryside Act.

4.3.12.2 Within 2 km of the source, local wildlife sites including the following:

- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local wildlife sites (LWS) and potential LWS (pLWS); and
- Ancient woodland (AWL).

4.3.12.3 Habitat receptor designations and locations relevant to the assessment are presented in Table 27 in Appendix C.

4.3.12.4 Note that Ramsar Sites designated under the Convention on Wetlands of International Importance are not specifically considered in the assessment,

as they are not subject to site specific Critical Loads, and in addition tend to broadly cover the same areas as SPAs.

4.3.12.5 The modelled ground level pollutant concentrations are used to predict deposition rates, using deposition velocities set out by the Environment Agency in the AQTAG(06) document. The dry deposition velocities for NO_2, SO_2, HCl and NH_3 are presented in Table 28 in Appendix C .

4.3.12.6 Following EA guidance[14], a long-term conversion rate of 70% for NO_x to NO_2 is applied to calculate nutrient nitrogen and acid deposition rates from NO_x.

4.3.12.7 Predicted ground level concentrations and acidification/ deposition rates are compared with relevant Critical Levels and Critical Loads for the protection of sensitive ecosystems and vegetation (see Appendix B).

4.3.12.8 The impact assessment on ecological sites has been performed on a tiered approach. This approach has been used to focus on the key ecological receptors, and eliminate from investigation those where it is clear that no likely significant effects will arise.

- Tier 1: The maximum impact anywhere within the designated habitat is compared to the most stringent Critical Level and Critical Load. Where this does not identify as a potentially significant contribution (see Table 9), the site is screened out.
- Tier 2: For the Tier 1 sites screened in, more detailed analysis is undertaken comparing the maximum impact anywhere within the designated habitat to the habitat type specific Critical Level and Critical Load.
- Tier 3: For the Tier 2 sites and habitat types screened in, these data are mapped and reviewed to identify the overlap of the critical habitat types, with locations where significant contributions are identified.

4.3.12.9 The Tier 1 and Tier 2 assessment results are set out in the AQIA (Appendix B). The Tier 3 assessment is provided in Chapter 10, Ecology and Nature Conservation, Appendix A (**Document Reference 6.2.10**) for Local and National Designations and European protected sites, and the Report to inform HRA (**Document Reference 5.9**) for European protected sites only.

4.3.12.10 Some habitats of interest overlap, in which case the maximum extent of all designated areas has been assessed. In terms of the dispersion modelling, impacts of air quality at the receptor locations are captured using a grid of receptors defined throughout each habitat.

4.3.13Ash Handling Dust

4.3.13.1 The process produces two types of ash: bottom ash; and Air Pollution Control (APC) residue.

4.3.13.2 Bottom ash is inert, and after metals have been separated, the material will be utilised on site for integration into concrete blocks in place of quarried

(14) https://consult.environment-agency.gov.uk/psc/bn15-8tu-enviropower-ltd/supporting_documents/Screening%20Habitats%20Assessment.pdf

raw aggregate. The ash will be wet when it emerges from the plant, as it will be dropped into a water quench, and as such will not be dusty when used as aggregate. Basic housekeeping measures at the plant and concrete block plant will be put in place to ensure that material spillage and dust generation is minimised, and that there will be negligible dust emission from this activity. This will include buildings being maintained at negative pressure. Since basic controls of proven effectiveness will be applied, and the material is inert, no detailed assessment has been made of this activity.

4.3.13.3 APC residue contains potentially hazardous materials, principally made up of unreacted lime and trace amounts of contaminants extracted from the flue gases. As such, it is considered to be a hazardous waste material and will be collected for disposal off-site. Some of the fly ash and APC residue will also be treated with carbon dioxide and used as a cementitious product as described above for bottom ash. For disposal off-site the material handing will be undertaken in a closed system, with APC residue collected and periodically removed from site by tanker. When the tanker is loaded, the air within the tanker will be piped back into the APC silo in a closed loop, rather than being vented to atmosphere, thus containing any entrained dust. As there is negligible risk of emission of APC residue due to this design, no detailed assessment is required.

4.3.14 Odour

4.3.14.1 The process will utilise waste materials which have the potential to be odorous. An odour assessment has been undertaken following the methodology set out by the Institute of Air quality Management (IAQM) [15]. The approach used is a qualitative risk-based assessment of the potential for odour emissions and impacts. The key elements of the assessment are as follows (based on Table 9 of the IAQM guideance):

- Odour Potential, described in terms of:
  - The tonnage of material handled
  - The odour detection threshold
  - The offensiveness of the odours
  - The Mitigation and control
- The Pathway, described in terms of:
  - Distance between source and receptors
  - Direction of receptor from source, accounting for local wind direction
  - Effectiveness of dilution and dispersion of odours
- Receptor sensitivity:
  - High sensitivity being locations that can expect a high level of amenity and people are constantly/regularly present such as residential locations
  - Medium sensitivity being locations where a reasonable level of amenity is expected and receptors are only intermittently present, for example commercial, retail or playing fields

[15] IAQM (2018) Guidance on the assessment of odour for planning

- Low sensitivity:
    - Amenity is not expected, transient receptors for example industrial facilities, footpaths and roads

5. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

5.1.1.1 The impacts on air quality of the emissions from the facility are assessed taking into consideration the:

- Process Contribution (PC), this being the contribution from the Project only;
- The existing baseline; and
- Predicted Environmental Concentration (PEC), this being the PC plus the baseline.

5.2 Construction Dust

5.2.1.1 The significance criteria for sensitive human receptors are taken from IAQM. The significance criteria for sensitive ecological receptors are taken from the IAQM Guidance on the assessment of dust from demolition and construction[16].

Factors defining the sensitivity of a receptor are presented in Table 5.

Table 5: Factors Defining the Sensitivity of a Receptor

Sensitivity	Human (Health)	Human (Dust soiling)	Ecological
High	■ Locations where members of the public are exposed over a time period relevant to the air quality objectives for PM_{10} (a) ■ Examples include residential dwellings, hospitals, schools and residential care homes.	■ Regular exposure. ■ High level of amenity expected. ■ Appearance, aesthetics or value of the property will be affected by dust soiling. ■ Examples include residential dwellings, museums, medium and long-term car parks and car showrooms.	■ Nationally or Internationally designated site with dust sensitive features (b) ■ Locations with vascular plant species (c)
Medium	■ Locations where workers are exposed over a time period relevant to the air quality objectives for PM_{10} (a) ■ Examples include office and shop workers (d)	■ Short term exposure. ■ Moderate level of amenity expected. ■ Possible diminished appearance or aesthetics of property due to dust soiling. ■ Examples include parks and places of work.	■ Nationally designated site with dust sensitive features (b) ■ Nationally designed sites with a particularly important plant species where dust sensitivity is unknown.
Low	■ Transient human exposure.	■ Transient exposure. ■ Enjoyment of amenity not expected.	■ Locally designated site with dust

[16] Ionstitute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction Version 1.1

	■ Examples include public footpaths, playing fields, parks and shopping streets.	■ Appearance and aesthetics of property unaffected. ■ Examples include playing fields, farmland [(e)], footpaths, short-term car parks and roads.	sensitive features [(b)]
[(a)] In the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day. *[(b)] Ecosystems that are particularly sensitive to dust deposition include lichens and acid heathland (for alkaline dust, such as concrete).* *[(c)] Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.* *[(d)] Does not include workers exposure to PM_{10} as protection is covered by Health and Safety at Work legislation.* *[(e)] Except commercially sensitive horticulture*			

5.2.1.2 The sensitivity of a receptor will also depend on a number of additional factors including any history of dust generating activities in the area, likely cumulative dust impacts from nearby construction sites, any pre-existing screening such as trees or buildings that would limit dust transport from a site and the likely duration of the impacts. In addition, the influence of the prevailing wind direction and local topography may be of relevance when determining the sensitivity of a receptor.

5.2.1.3 The sensitivity of the area to health impacts is dependent on the number of receptors within each sensitivity class and their distance from the source. In addition, human health impacts are dependent on the existing PM_{10} concentrations in the area. Table 6 summarises the criteria for determining the overall sensitivity of the area to health impacts.

Table 6: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} (ug/m^3)	Number of Receptors	Distance from the source				
			<20m	<50m	<100m	<200m	<350m
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 7: Sensitivity of Area to Ecological Impact

Receptor Sensitivity	Distance from the Source	
	<20m	<50m
High	High	Medium
Medium	Medium	Low
Low	Low	Low

5.3 Operation – Human

5.3.1.1 Guidance set out by Environmental Protection UK / Institute of Air Quality Management (EPUK / IAQM) details descriptors for evaluating a predicted impact at individual receptor locations; these criteria are presented in Table 8.

Table 8: Impact Descriptions for Individual Receptors

Long-term average concentration at receptor in assessment year	% Change in Concentration relative to Air Quality Assessment Level (AQAL)			
Long Term PEC	1%	2-5%	6-10%	>10%
75% or less of AQAL	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Minor	Moderate	Moderate	Major
103-109% of AQAL	Moderate	Moderate	Major	Major
110% or more of AQAL	Moderate	Major	Major	Major
Short Term PC	<10%	10-20%	20-50%	>50%
(not dependent on baseline)	Negligible	Minor	Moderate	Substantial

5.3.1.2 The guidance states that percentage changes in concentration, relative to the air quality assessment level (AQAL), of less than 1%, but greater than or equal to 0.5%, should be rounded up to 1%. Changes of less than 0.5% are described as 'negligible'.

5.3.1.3 The overall significance of the effects of a proposed development is determined by professional judgement, taking into account the air quality impact at individual receptors and other factors such as the number of people or properties that will be exposed to a change in air quality.

5.4 Operation - Ecological

5.4.1.1 The Environment Agency criteria for identifying whether a significant contribution is made to impacts at sensitive ecological receptors are set out in Table 9. In this case, the percentage is not rounded, ie <1% is an insignificant contribution and will not lead to a significant effect.

Table 9: Criteria for sensitive ecological receptors

Criterion	Assessment Outcome
Long Term	
PC < 1% of CL	Insignificant contribution and no further assessment required.
PC > 1% of CL and PEC < 70% of CL	Unlikely to make a significant (1) contribution and no further assessment required.
PC > 1% of CL and PEC > 70% of CL	Significant contribution and therefore detailed assessment required.

Criterion	Assessment Outcome
Short Term	
PC < 10% of CL	Insignificant contribution and no further assessment required.
PC > 10% of CL and PEC < 70% of CL	Unlikely to make a significant contribution and no further assessment required.
PC > 10% of CL and PEC > 70% of CL	Significant contribution and therefore detailed assessment required.

Note 1: The term 'significant' is used here in the context of its meaning within the Environment Agency guidance (i.e. making a 'significant contribution') and not within the context of the EIA Regulations 2017 (i.e. not necessarily leading to a 'likely significant effect').

5.5 Operational – Odour

5.5.1.1 Following the method set out in Section 4.3.14, a qualitative odour assessment has been undertaken. The following points are noted with regards to the handling, storage and processing of RDF arriving at the Project:

- There will be no outdoor storage of waste as part of the Project.
- Rail: deliveries of waste will be in sealed containers. Upon delivery, the containers will be taken to the tipping hall and emptied. During this process, full containers will not be stored on site.
- Ship: deliveries of waste will be in sealed containers. Upon delivery, the containers will be taken to the tipping hall and emptied. During this process, full containers will not be stored on site.
- Road: baled (i.e. fully contained in layers of plastic wrapping) waste will be delivered in curtain sided trucks. Waste will be tipped directly in the tipping hall, and will not be stored on site.
- The tipping hall will therefore be the only area where waste will be opened and exposed to the air
- The tipping hall will be maintained under negative pressure with all air from the tipping hall drawn through the plant.
- In the plant, the combustion temperature will be sufficient to destroy odorous compounds and as such there will be negligible odours released from the ERF stack.

5.5.1.2 The odour impact assessment is set out in Table 10.

Table 10: Odour Assessment

Criteria	Project activity	IAQM Ranking	Notes
Odour Potential			
Tonnage of material	Up to 760,000 tpa	High	
Odour detection threshold	Very low for mercaptans and hydrogen sulphide	High	The RDF may contain highly odorous compounds particularly in hot weather
Offensivess of odour	Highly offensive	High	
Mitigation and control	Very high degree of mitigation	Low	As noted in Section 5.5.1.1 the Project is designed to inherently contain and destroy odours. As such, the potential for emissions is considered to be negligible despite the high potential offensiveness of odour
Pathway			
Distance between source and receptors			
Distance and direction of receptor from source, accounting for local wind direction (measured from red line boundary)	Residential: Flixborough Stather: <50m west	High	The prevailing wind direction is southwesterly, with a northeasterly component. Any odours would disperse primarily towards the industrial estate to the northeast and south towards Neap house with fewer hours in other directions
	Residential: Amcotts: ~250m west	Low	
	Residential: Flixborough Village: ~900m east	Low	
	Residential: Neap House: ~1000m south	Low	
	Residential: Park Ings Farm: ~950m east	Low	
	Industrial: Adjacent industrial units: <50m north and east	High	
Effectiveness of dilution and dispersion of odours	Any odour emission would be at ground level from fugitive sources associated with the tipping hall	Medium	The tipping hall is not on the red line boundary, allowing

Criteria	Project activity	IAQM Ranking	Notes
Odour Potential			
			some degree of dispersion to occur
Receptor Sensitivity			
High	Residential locations	High	
Medium	River Trent, understood to be used for fishing, dog walking and recreation	Medium	
Low	Nearby industrial facilities	Low	

5.5.1.3 The waste materials within the RDF have the potential to be inherently odorous as there are organic components which will decompose and result in odour. As noted in the odour assessment, odours are potentially offensive and contain substances have very low odour thresholds. As such, the process of handling and processing waste is undertaken in a manner which is inherently designed to avoid odours escaping into the ambient environment using the multiple controls noted.

5.5.1.4 Considering the IAQM Table 10 to assess risk whilst the Source Odour Potential is acknowledged to be potentially ‘Large’, the design of the project inherently creates the ‘ineffective pathway’. As such, it is reasonable to conclude that the risk of odour nuisance is low to negligible.

6. BASELINE

6.1 Sensitive Human Receptors

6.1.1.1 The baseline information has been obtained from publicly available sources to derive a representative local baseline. For some of the pollutants, little baseline data is available, and this has been derived from non-local sources, which are considered likely to represent the local conditions. The available baseline information has been considered to derive a single value for each pollutant to be used in the assessment. The baseline used in the assessment is considered to be a reasonable best estimate for the impact assessment, and noted is the fact that in no case is the baseline lose to the air quality standard and any local variability will not materially affect results.

6.1.1.2 The short-term average has been derived from multiplying the long-term background by two, as per Environment Agency guidance. The following are noted:

- The Site is within the jurisdictions of North Lincolnshire Borough Council and Flixborough Parish Council.
- There are no complementary rural monitoring programmes (automatic or diffusion) taking place in the area of the Project. Monitoring undertaken in Scunthorpe is not representative of the Study area due to the urban and industrialised characters of the Scunthorpe monitoring sites.
- Data from various monitoring stations have been used, reflecting the paucity of data for some pollutants. Data has been obtained from stations that are considered to be most representative of the receptors close to the project. Data from the closest station is not necessarily representative as some of these are in urban and industrial areas with dissimilar local sources of emissions. In some cases, baseline data is particularly scarce and the best estimate is used based upon that data that does exist.

6.1.1.3 The baseline has therefore been determined as follows.

- PM10, PM2.5, NO2 and NOx have been derived from Defra mapping for 2018.
- SO2 and NH3 are from Hull Ladybower, 2018.
- HCl is from Hull Ladybower, 2015.
- Ozone is from Hull Ladybower, 2020.
- CO is from Birmingham Airport, 2018. This site is selected as it is deemed to be the most representative, noting the paucity of sites monitoring CO.
- Benzene was from Scunthorpe Town, 2018.
- HF Indicative baseline is as set out on Page 27 of EPAQS (2007) Guidelines for Halogens and Hydrogen Halides in Ambient Air for Protecting Human Health against Acute Irritancy Effects.

- As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, V have been derived from monitoring undertaken at Fenny Compton in Warwickshire, 2018.
- Sb has been derived from Monks Wood, 2009.
- CrVI has been derived on the basis of total Cr, factored by the Environment Agency guidance for CrVI emissions from ERF plants.
- Dioxins and furans are from High Muffles, Yorkshire, 2015.
- PAHs, as Benzo[a]Pyrene from High Muffles, quarter 1 2014.

6.1.1.4 Regarding the non-local sites, the following observations are made.

- Hull Ladybower was selected as it is a rural site and is considered to be more similar in character to the facility locale when compared to an urban industrial site.
- Fenny Compton in Warwickshire was selected as it is a rural site, and is considered to be more similar in character to the facility locale, when compared to an urban industrial site.
- Birmingham Airport is the closest CO monitoring location to the facility.
- Monks Wood is the closest Sb monitoring location to the facility.
- High Muffles is the closest rural dioxins and furans monitoring location to the facility.

6.1.1.5 Baseline data for N-amines is extremely scarce. A small number of monitoring campaigns have been undertaken, primarily focussing on industrial areas with a known source of N-amine and amine emissions or on urban areas. Technology Centre Mongstad (TCM) has undertaken limited monitoring around the Mongstad facility which identified N-amine concentrations below the limit of detection. In those studies, identified baseline levels are in the nanogram range. On the basis that there are no existing industrial amine or N-amine sources in the study area, the baseline is assumed to be negligible and the PEC has therefore not been calculated.

6.1.1.6 The baseline used for assessing impacts on humans in the study is set out in Table 10.

Table 11: Baseline

Pollutant	Averaging period	AQS ($\mu g/m^3$)	Baseline ($\mu g/m^3$)
PM_{10}	Annual mean	40	16.5
	24 hour mean, not to be exceeded more than 35 times per year	50	32.9
$PM_{2.5}$	Annual mean	25	8.98
NO_2	Annual mean	40	10.2
	1 hour mean, not to be exceeded more than 18 times per year	200	20.4
SO_2	24 hour mean, not to be exceeded more than 3 times per year	125	3.65

Pollutant	Averaging period	AQS (µg/m^3)	Baseline (µg/m^3)
	1 hour mean, not to be exceeded more than 24 times per year	350	3.65
	15 min mean, not to be exceeded more than 35 times per year	266	3.65
CO	Maximum 8 hour daily mean	10,000	174
	Maximum 1 hour daily mean	30,000	174
VOC (as benzene) (1)	Annual mean	5	0.873
	1 hour maximum	195	1.75
HCl	1 hour maximum	750	0.225
HF	1 hour maximum	160	2.46
	monthly	16	1.23
Dioxins	No AQS		
PAH (as benzo[a]pyrene)(2)	Annual mean	0.001	6.80×10^{-5}
Sb	Annual mean	5	1.01×10^{-3}
	1 hour maximum	150	2.02×10^{-3}
As	Annual mean	0.006	8.04×10^{-4}
	Annual mean	0.003	8.04×10^{-4}
Cd	Annual mean	0.005	1.04×10^{-4}
Cu	Annual mean	10	3.16×10^{-3}
	1 hour maximum	200	6.32×10^{-3}
CrIII	Annual mean	5	1.49×10^{-3}
	1 hour maximum	150	2.98×10^{-3}
Cr (as Cr VI)	Annual mean	0.0002	1.49×10^{-5}
Mn	Annual mean	0.15	3.04×10^{-3}
	1 hour maximum	1500	6.09×10^{-3}
Hg	Annual mean	0.25	1.5310^{-2}
	1 hour maximum	7.5	3.0710^{-2}
Ni	Annual mean	0.02	5.33×10^{-4}
Tl	Annual mean	1	No data
	1 hour maximum	30	No data
Pb	Annual mean	0.5	5.44×10^{-3}
	Annual mean	0.25	5.44×10^{-3}
V	Annual mean	5	6.26×10^{-4}
NH_3	Annual mean	1	0.632
	1 hour maximum	180	1.26

6.2 Sensitive Ecological Receptors

6.2.1.1 The baseline at sensitive ecological receptors is site specific, and is set out in Appendix B. The baseline is derived from two sources, Defra background mapping [17] and data from APIS [18].

[17] Defra (accessed April 2021) Background Mapping data for local authorities https://uk-air.defra.gov.uk/data/laqm-background-home

[18] Air Pollution Information System (accessed April 2021) http://www.apis.ac.uk/

7. MITIGATION

7.1.1.1 This section describes the mitigation measures considered in the assessment as reported in this ES. This includes mitigation that is integral to the design of the Project and good practice mitigation measures that the Project is committed to adopting. All the mitigation measures described in the ES are committed to by the Project and the significance of the residual environmental effects reported in the ES is based on adoption of these measures.

7.2 Operation

7.2.1.1 The following mitigation is incorporated into the design:

- Abatement – the ERF is designed with Best Available Technique abatement systems for reducing emissions to air. Flue gases are further scrubbed before CO2 removal and the final emissions misted which will further reduce emissions and particulates.
- Stack heights – the stack heights for the ERF, backup generator and backup boilers are designed to disperse emissions sufficiently to avoid unacceptable impacts on air quality at sensitive human and ecological receptors.
- Odour – the ERF is designed to avoid the release of odour. This includes:
  - There will be no outdoor storage of waste planned as part of the Project.
  - Rail: deliveries of waste will be in sealed containers. Upon delivery, the containers will be taken to the tipping hall and emptied. During this process, full containers will not be stored on site.
  - Ship: deliveries of waste will be in sealed containers. Upon delivery, the containers will be taken to the tipping hall and emptied. During this process, full containers will not be stored on site.
  - Road: baled waste will be delivered in curtain sided trucks. Bulk waste will be sheeted and some road transported waste may be in sealed containers. Waste will be tipped directly in the tipping hall, and will not be stored on site.
  - The tipping hall will be kept under negative pressure and air will be drawn through the process thereby destroying odours.
  - RDF deliveries by road will predominantly be wrapped and baled, minimising odour during handling.
  - RDF will be stored under cover under negative pressure, minimising odour generation and escape.
  - At any one time, only one line will be off-line for maintenance, meaning that RDF will not be stored for long periods on site.
  - An odour management plan will be prepared as part of the Environmental Permit. The function will be to maintain a record of

any issues or complaints arising with odour and if required odour monitoring and reporting.

- Dust –
  - the handling of bottom ash and production of concrete will be undertaken in an enclosed environment, minimising dust generation and migration.
  - Flue Gas Residue will be handled in an enclosed process minimising the opportunity for dust generation and escape before being mixed with CO_2 to form cementitious product.

7.3 Construction

7.3.1.1 The dust impact assessment concluded that the impacts are such that the construction activity for the ERF and new road is classified as 'high risk' of causing dust nuisance due to demolition, earthworks, construction and trackout. Therefore, mitigation measures applicable to 'high risk' sites will be implemented in order to render the residual impacts as negligible, or at worst, small. These are derived from IAQM guidance and are set out in Table 11:

Table 12: Construction Dust Mitigation

Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
Display the head or regional office contact information.
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, for approval by the North Lincolnshire Council. The DMP will be a component plan of the Construction Environmental Management Plan (CEMP). An outline DMP is provided as an appendix to the Code of Construction Practice (CoCP) in Annex 8 to the ES. The level of detail in the DMP will depend on the risk, and will include as a minimum the highly recommended measures in this document. The desirable measures will be included as appropriate for the site. The DMP will include monitoring of dust deposition, dust flux, real time PM_{10} continuous monitoring and/or visual inspections.
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
Make the complaints log available to North Lincolnshire Council when asked.
Record any exceptional incidents that cause dust and/or gaseous emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to North Lincolnshire Council when asked. This will include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary.
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to North Lincolnshire Council when asked.
Increase the frequency of site inspections by the person accountable for air quality and dust issues onsite when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.

Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
Keep site fencing, barriers and scaffolding clean using wet methods.
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
Cover, seed or fence stockpiles to prevent wind whipping.
Ensure all vehicles switch off engines when stationary - no idling vehicles.
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of North Lincolnshire Council, where appropriate).
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
Use enclosed chutes and conveyors and covered skips.
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
Ensure equipment is readily available onsite to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Avoid bonfires and burning of waste materials.
Demolition
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.
Avoid explosive blasting, using appropriate manual or mechanical alternatives.
Bag and remove any biological debris or damp down such material before demolition.
Earthworks
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
Only remove the cover in small areas during work and not all at once.
Construction
Avoid scabbling (roughening of concrete surfaces) if possible.

Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.
Trackout
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
Avoid dry sweeping of large areas.
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
Record all inspections of haul routes and any subsequent action in a site log book.
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
Access gates to be located at least 10 m from receptors where possible.

8. ASSESSMENT OF LIKELY EFFECTS

8.1 Construction Traffic

8.1.1.1 The IAQM and Defra TG(16) screening criteria for road traffic have been applied to the construction traffic. The construction HGVs are <100 HGVs AADT and based on the IAQM screening criteria, air quality impacts will be not significant. The total construction traffic results in an increase in traffic of less than 25% on all roads and based on TG(16) screening criteria, air quality impacts will be not significant. On this basis, effects of construction traffic are predicted to be of not significant.

8.2 Construction Dust

8.2.1.1 As noted above, potential impacts associated with construction dust can be mitigated to the point that impacts are negligible, or at worst minor, with the implementation of best practice measures and the correct mitigation. With the implementation of the mitigation set out in Section 7, effects on receptors are predicted to be not significant.

8.3 Operational Effects - Humans

8.3.1.1 The predicted impacts for all pollutants are shown in Table 12 and Table 13, and Figure 4 - Figure 8, for non-traffic impacts. As noted, the PCs for NO_2 include emissions for the ERF, backup boilers, backup generator, ship and rail.

Table 13: Predicted Impacts – Human, Non-Traffic

Pollutant	Averaging Period and Statistic	Value, µg/m3	Baseline µg/m3	PC, µg/m3	PC/AQS, %	PEC, µg/m3	PEC/AQS, %	IAQM Criteria
PM_{10}	Annual mean	40	16.5	0.0330	0.082%	16.5	41%	Negligible
	24 hour mean, not to be exceeded more than 35 times per year	50	32.9	0.1165	0.23%	33.1	66%	Negligible
$PM_{2.5}$	Annual mean	25	8.98	0.0330	0.132%	9.02	36%	Negligible
NO_2 (converted from NOx)	Annual mean	40	10.2	1.91	4.8%	12.1	30%	Negligible
	1 hour mean, not to be exceeded more than 18 times per year	200	20.4	36.3	18.1%	56.7	28%	Negligible
SO_2	24 hour mean, not to be exceeded more than 3 times per year	125	3.65	1.84	1.5%	5.49	4.4%	Negligible
	1 hour mean, not to be exceeded more than 24 times per year	350	3.65	5.46	1.6%	9.11	2.6%	Negligible
	15 min mean, not to be exceeded more than 35 times per year	266	3.65	6.55	2.5%	10.20	3.8%	Negligible
CO	Maximum 8 hour daily mean	10,000	349	2.1	0.02%	351	3.5%	Negligible
	Maximum 1 hour daily mean	30,000	349	4.4	0.015%	353	1.2%	Negligible
VOC (as benzene)	Annual mean	5	0.873	0.0659	1.32%	0.939	19%	Negligible
	1 hour maximum	195	1.747	4.44	2.3%	6.19	3.2%	Negligible
HCl	1 hour maximum	750	0.225	2.66	0.36%	2.89	0.39%	Negligible

Pollutant	Averaging Period and Statistic	Value, µg/m3	Baseline µg/m3	PC, µg/m3	PC/AQS, %	PEC, µg/m3	PEC/AQS, %	IAQM Criteria
HF	1 hour maximum	160	2.46	0.444	0.28%	2.90	1.8%	Negligible
	monthly	16	1.23	$6.59x10^{-3}$	0.041%	1.24	7.7%	Negligible
Dioxins	No AQS			$3.95x10^{-10}$				
PAH (as benzo[a]pyrene)	Annual mean	0.001	$6.80x10^{-5}$	$1.32x10^{-6}$	0.1%	$6.93x10^{-5}$	6.9%	Negligible
Sb	Annual mean	5	$1.01x10^{-3}$	$9.89x10^{-6}$	0.000198%	$1.02x10^{-3}$	0.020%	Negligible
	1 hour maximum	150	$2.02x10^{-3}$	$6.66x10^{-4}$	0.00044%	$2.69x10^{-3}$	0.0018%	Negligible
As	Annual mean	0.006	$8.04x10^{-4}$	$6.59x10^{-6}$	0.110%	$8.11x10^{-4}$	14%	Negligible
	Annual mean	0.003	$8.04x10^{-4}$	$6.59x10^{-6}$	0.220%	$8.11x10^{-4}$	27%	Negligible
Cd	Annual mean	0.005	$1.04x10^{-4}$	$1.32x10^{-4}$	2.6%	$2.36x10^{-4}$	4.7%	Negligible
Cu	Annual mean	10	$3.16x10^{-3}$	$4.94x10^{-5}$	0.00049%	$3.21x10^{-3}$	0.032%	Negligible
	1 hour maximum	200	$6.32x10^{-3}$	$3.33x10^{-3}$	0.00167%	$9.66x10^{-3}$	0.0048%	Negligible
Total Cr	Annual mean	5	$1.49x10^{-3}$	$5.60x10^{-5}$	0.00112%	$1.54x10^{-3}$	0.031%	Negligible
	1 hour maximum	150	$2.98x10^{-3}$	$3.77x10^{-3}$	0.00252%	$6.75x10^{-3}$	0.0045%	Negligible
Cr (as Cr VI)	Annual mean	0.0002	$1.49x10^{-5}$	$3.30x10^{-7}$	0.165%	$1.52x10^{-5}$	7.6%	Negligible
Mn	Annual mean	0.15	$3.04x10^{-3}$	$1.12x10^{-4}$	0.075%	$3.16x10^{-3}$	2.1%	Negligible
	1 hour maximum	1500	$6.09x10^{-3}$	$7.55x10^{-3}$	0.00050%	$1.36x10^{-2}$	0.00091%	Negligible
Hg	Annual mean	0.25	$1.53x10^{-2}$	$4.61x10^{-8}$	0.000018%	0.0153	6.14%	Negligible
	1 hour maximum	7.5	$3.07x10^{-2}$	$3.11x10^{-6}$	0.000041%	0.0307	0.41%	Negligible
Ni	Annual mean	0.02	$5.33x10^{-4}$	$9.89x10^{-5}$	0.49%	$6.32x10^{-4}$	3.2%	Negligible
Tl	Annual mean	1	na	$1.32x10^{-4}$	0.0132%			Negligible
	1 hour maximum	30	na	$8.88x10^{-3}$	0.030%			Negligible
Pb	Annual mean	0.5	0.01	$7.25x10^{-5}$	0.0145%	$5.51x10^{-3}$	1.1%	Negligible
	Annual mean	0.25	0.01	$7.25x10^{-5}$	0.0290%	$5.51x10^{-3}$	2.2%	Negligible

Pollutant	Averaging Period and Statistic	Value, µg/m3	Baseline µg/m3	PC, µg/m3	PC/AQS, %	PEC, µg/m3	PEC/AQS, %	IAQM Criteria
V	Annual mean	5	$6.26x10^{-4}$	$3.30x10^{-6}$	0.000066%	$6.29x10^{-4}$	0.013%	Negligible
	1 hour maximum	1	$1.25x10^{-3}$	$2.22x10^{-4}$	0.0222%	$1.47x10^{-3}$	0.15%	Negligible
NH_3	Annual mean	180	0.63	$6.59x10^{-2}$	0.037%	0.698	0.39%	Negligible
	1 hour maximum	2500	1.26	4.44	0.18%	5.71	0.23%	Negligible
Total Amines	24 hour maximum	100	na	$3.44x10^{-3}$	0.0034%	0.00344	0.0034%	Negligible
Total Amines	1 hour maximum	400	na	$1.58x10^{-2}$	0.0040%	0.0158	0.0040%	Negligible
N-Amine	Annual mean	0.0002	na	$6.13x10^{-8}$	0.0307%	$6.13x10^{-8}$	0.0307%	Negligible

Table 14: Predicted Impacts – Human, Traffic

Receptor	Averaging Period and Statistic	Value, µg/m³	Baseline µg/m³	PC, µg/m³	PC/AQS, %	PEC, µg/m³	PEC/AQS, %	IAQM Criteria
R1	Annual mean	40	10.2	0.250	0.63%	10.4	26%	Negligible
R2	Annual mean	40	10.2	0.190	0.48%	10.4	26%	Negligible
R3	Annual mean	40	10.2	0.130	0.33%	10.3	26%	Negligible
R4	Annual mean	40	10.2	0.500	1.3%	10.7	27%	Negligible

8.3.1.2 On the basis of the results set out above there are predicted to be negligible impacts on air quality associated with emissions to air and no significant effects on sensitive human receptors from the Project.

8.3.1.3 With regards to odour, there will be no storage of waste outdoors, and all material will be taken directly to the tipping hall in sealed containers, or unloaded directly from trucks. The plant itself is designed to inherently be odour free. Negative pressure will be maintained within the waste reception hall. All air will then be drawn through the process, so any odorous compounds will be destroyed. Furthermore, maintenance on the plant will be scheduled such that each process line can be closed down in turn, and therefore waste will not be left to sit for prolonged periods in the tipping hall. Waste delivered to the site will be wrapped or sealed in containers minimising odour emissions, and storage will be indoors, again minimising odour emissions prior to being input to the plant. These measures will effectively control odours.

8.4 Operational Effects - Ecology

8.4.1.1 The detailed results of the assessment steps are set out in Appendix B. As noted, the predicted impacts include NOx emissions from the ERF, backup boilers, backup generator, ship, rail and, for annual mean impacts, road traffic. In summary:

- NOx annual mean – there is predicted to be an insignificant contribution at all sites.
- NOx 24 hour mean:
  - There is predicted to be a potentially significant contribution and therefore detailed assessment is required at the Humber Estuary SSSI and SAC. Further details of the specific habitat types and impacts are set out in Chapter 10 (**Document Reference 6.2.10, Appendix A**).
- SO_2 annual mean:
  - Upper species - there is predicted to be an insignificant contribution at all sites.
  - Lichens and bryophytes - there is predicted to be an insignificant contribution at all sites.
- NH_3 annual mean:
  - There is predicted to be a potentially significant contribution and therefore detailed assessment is required at Humber Estuary SSSI and SAC and Risby Warren SSSI. Further details of the specific habitat types and impacts are set out in Chapter 10, Ecology and Nature Conservation, Appendix A.
- HF weekly mean - there is predicted to be an insignificant contribution at all sites.
- HF daily mean - there is predicted to be an insignificant contribution at all sites.

- Nutrient Nitrogen Deposition:
  - there is predicted to be an insignificant contribution at all sites except for the Humber Estuary SAC, SPA and SSSI, and Risby Warren SSSI. Further details of the specific habitat types and impacts are set out in Chapter 10, Ecology and Nature Conservation, Appendix A.
- Acid Deposition
  - there is predicted to be an insignificant contribution at all sites except for the Humber Estuary SAC, SPA and SSSI, Risby Warren SSSI and Messingham Heath SSSI. Further details of the specific habitat types and impacts are set out in Chapter 10, Ecology and Nature Conservation, Appendix A.

8.4.1.2 On the basis of the findings of the AQIA further assessment has been undertaken to investigate 24 hour NO_x, Annual Mean Ammonia, Nutrient Nitrogen Deposition and Acid Deposition. The findings of these assessments are set out in Chapter 10, Ecology and Nature Conservation, Appendix A for Local and National Designations, and European protected sites. In the context of the Conservation of Habitats and Species Regulations 2017, effects on European protected sites from the Project alone and in combination with other developments are addressed in the Report to inform HRA (**Document Reference 5.9**).

9. CONCLUSIONS

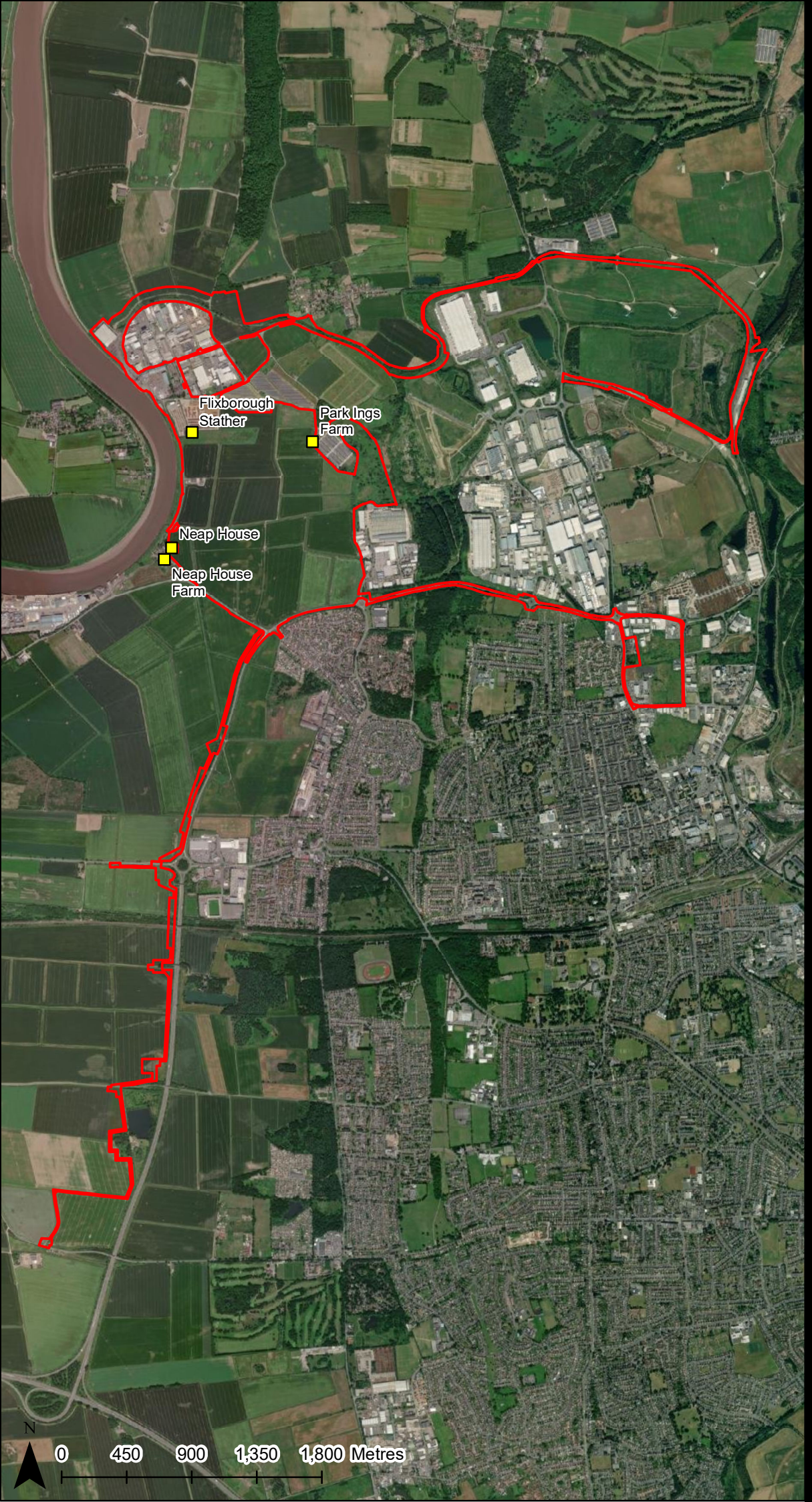
9.1.1.1 The construction phase will include the implementation of mitigation measures to minimise emissions of dust and PM_{10}. These measures will be implemented for the construction of the ERF (and associated facilities), the new road and the district heating scheme. Site boundary dust or PM_{10} monitoring will be undertaken during construction, as part of the Dust Management Plan. With mitigation in place emissions to air during the construction phase will have no significant effects.

9.1.1.2 The AQIA concludes that operational impacts on air quality at sensitive human receptors will be negligible and there will be no significant effects on human health due to airborne concentrations of pollutants.

9.1.1.3 With regards to N-amines there is very limited information available on existing baseline concentrations. However, the EAL for NDMA used in this EIA is based upon the carcinogenic risk of exposure to N-amines, and is based upon the 'acceptable' risk defined by the Environment Agency of 1 in 100,000 lifetime risk. As such, the Process Contribution as a percentage of the EAL is the important metric, rather than the PEC and on this basis the absence of baseline data is of lesser importance. Given that the assessment of N-amines is a relatively new area of environmental study, albeit based upon a long history of experimental science, the project commits to undertaking monitoring of amines and N-amines when operational, both in flue gases and in the environment.

9.1.1.4 The AQIA also concludes that for most pollutants of concern and protected sites, the Project will not make a significant contribution. However, further assessment of potentially significant effects on habitats for some protected sites is presented in the Chapter 10, Appendix A of the ES (**Document Reference 6.2.10**), with further consideration of the spatial aspects of the project, and the specific sensitivity of receptor species.

APPENDIX A FIGURES



NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 1a Traffic Modelling: Human Receptors

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	15/03/2022
Drawn by	MTC
Checked by	SW
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	35,000

ArcMap File

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AQ_ES_HumanReceptors_A01

Legend

- Human Receptor
- Order Limits

Layer Source Information

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community© Crown copyright and

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NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 1b New Road and Human Receptor/ Habitats Relationship

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	17/05/2022
Drawn by	MTC
Checked by	CHM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	10,000

ArcMap File

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AQ_ES_RoadNetwork_HumanReceptors_A01

Legend

- Human Receptor
- New Road
- Order Limits
- New Road 200m Buffer (from road edge)
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Ramsar Site

Layer Source Information

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community© Crown copyright and database rights 2021 OS Licence

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Figure 2: Modelled Building Locations

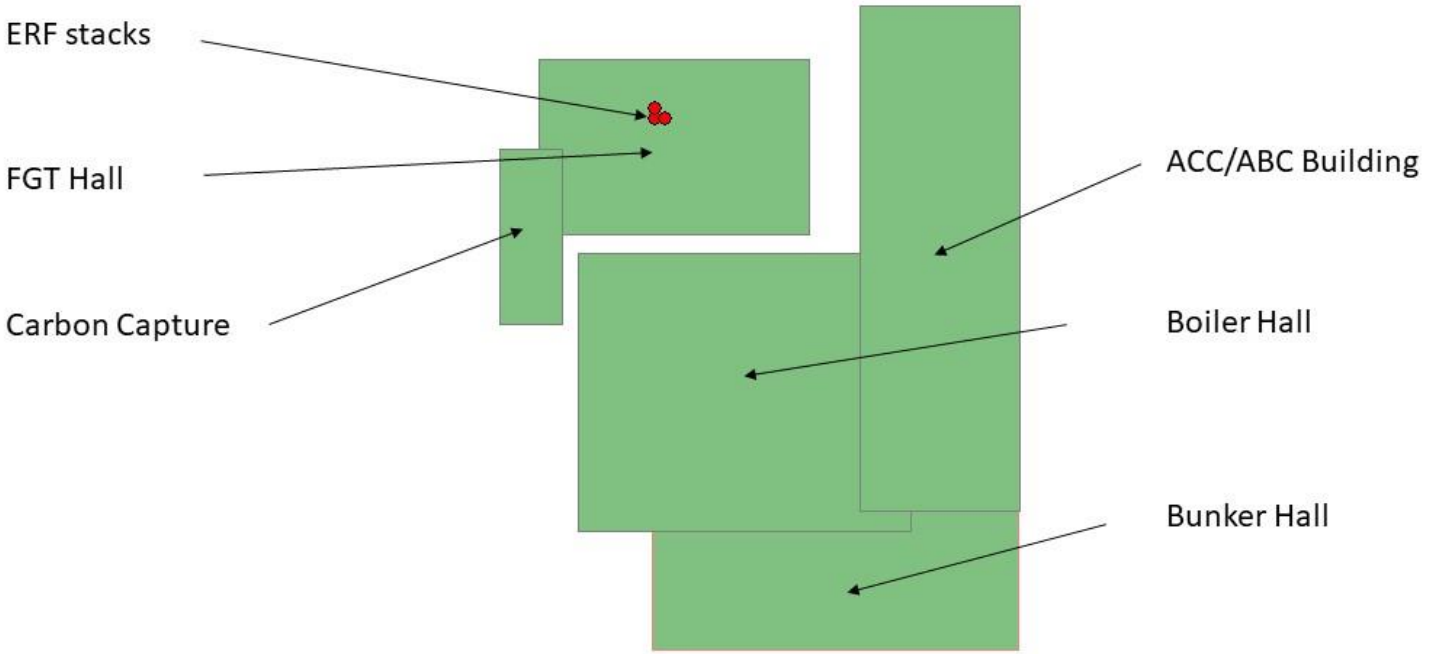
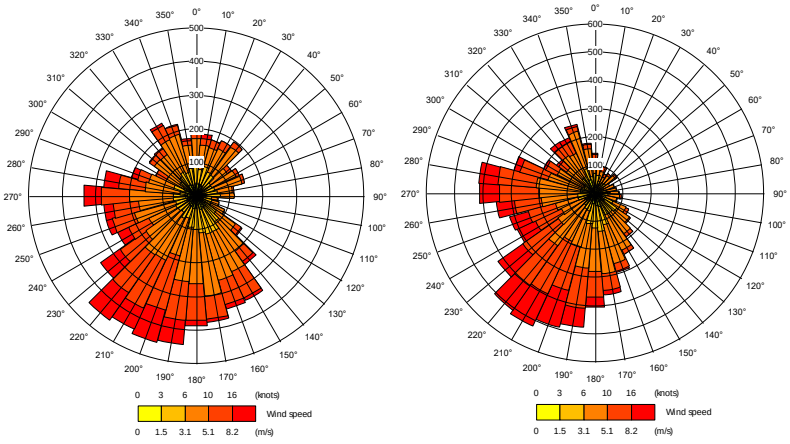
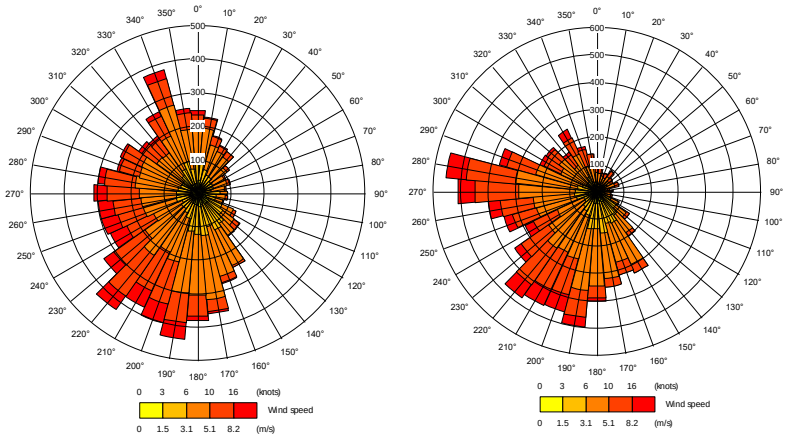


Figure 3: Wind Rose 2014 - 2018



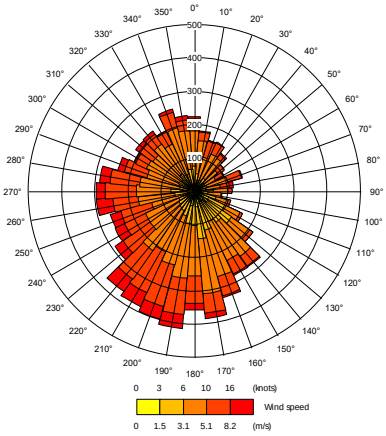
2014

2015

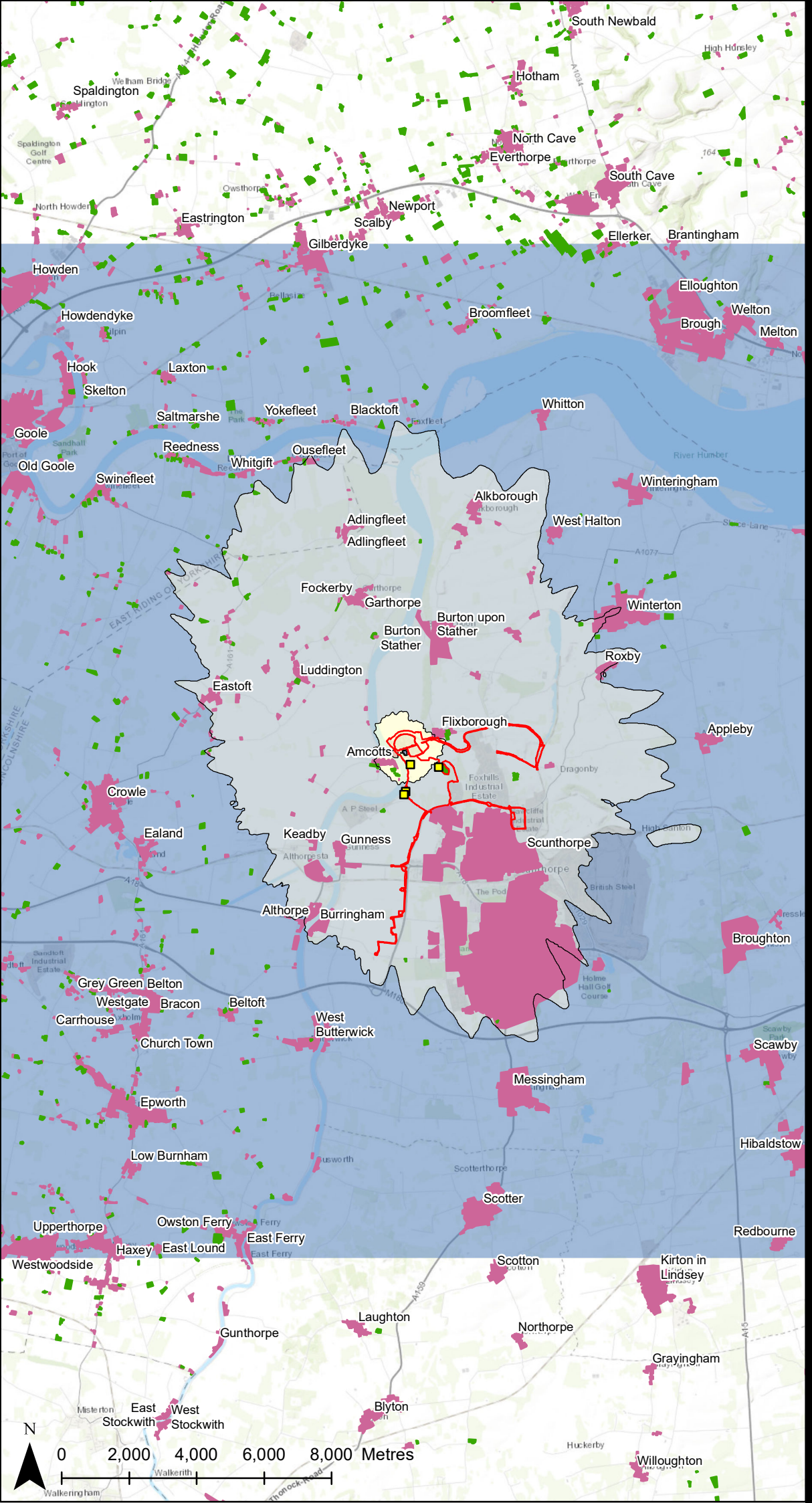


2016

2017



2018



NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 4 NO_2 1 Hour Maximum Contours

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	05/05/2023
Drawn by	MTC
Checked by	CHM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	150,000

ArcMap File

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AQ_ES_Contours_NO2_1_Hour_A01

Legend

- Human Receptor
- Order Limits
- Residential Receptor
- Farm Receptor

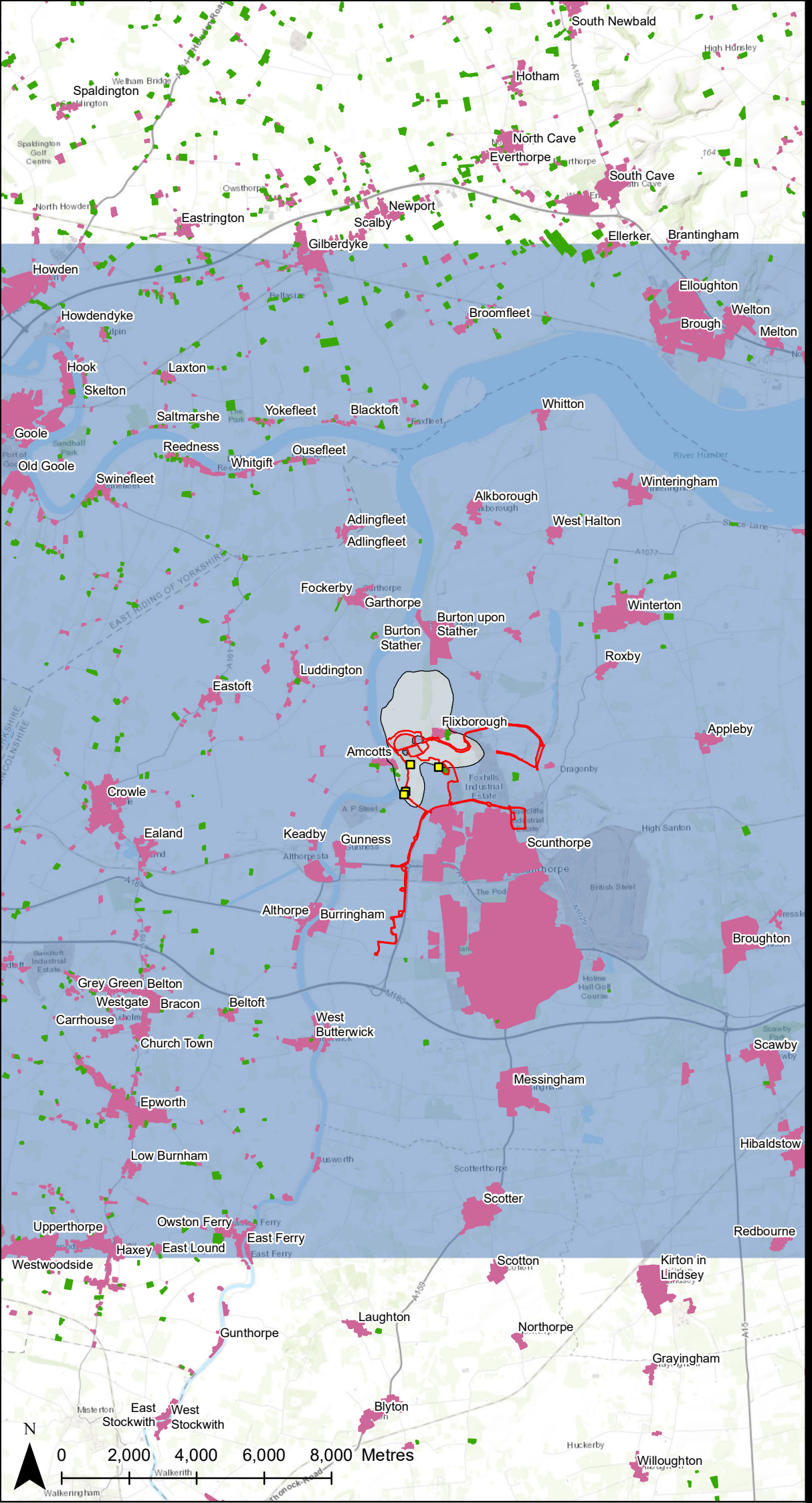
NO_2 1 hour Maximum Concentration (µg/m²) AQS 200

- < 2
- 2 - 10
- 10 - 20
- 20 - 200

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

DO NOT SCALE THIS DRAWING



NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 5 NO_2 Annual Mean Contours

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	05/05/2023
Drawn by	MTC
Checked by	CHM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	150,000

ArcMap File

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AQ_ES_Contours_NO2_Annual_A01

Legend

- Human Receptor
- Order Limits
- Residential Receptor
- Farm Receptor

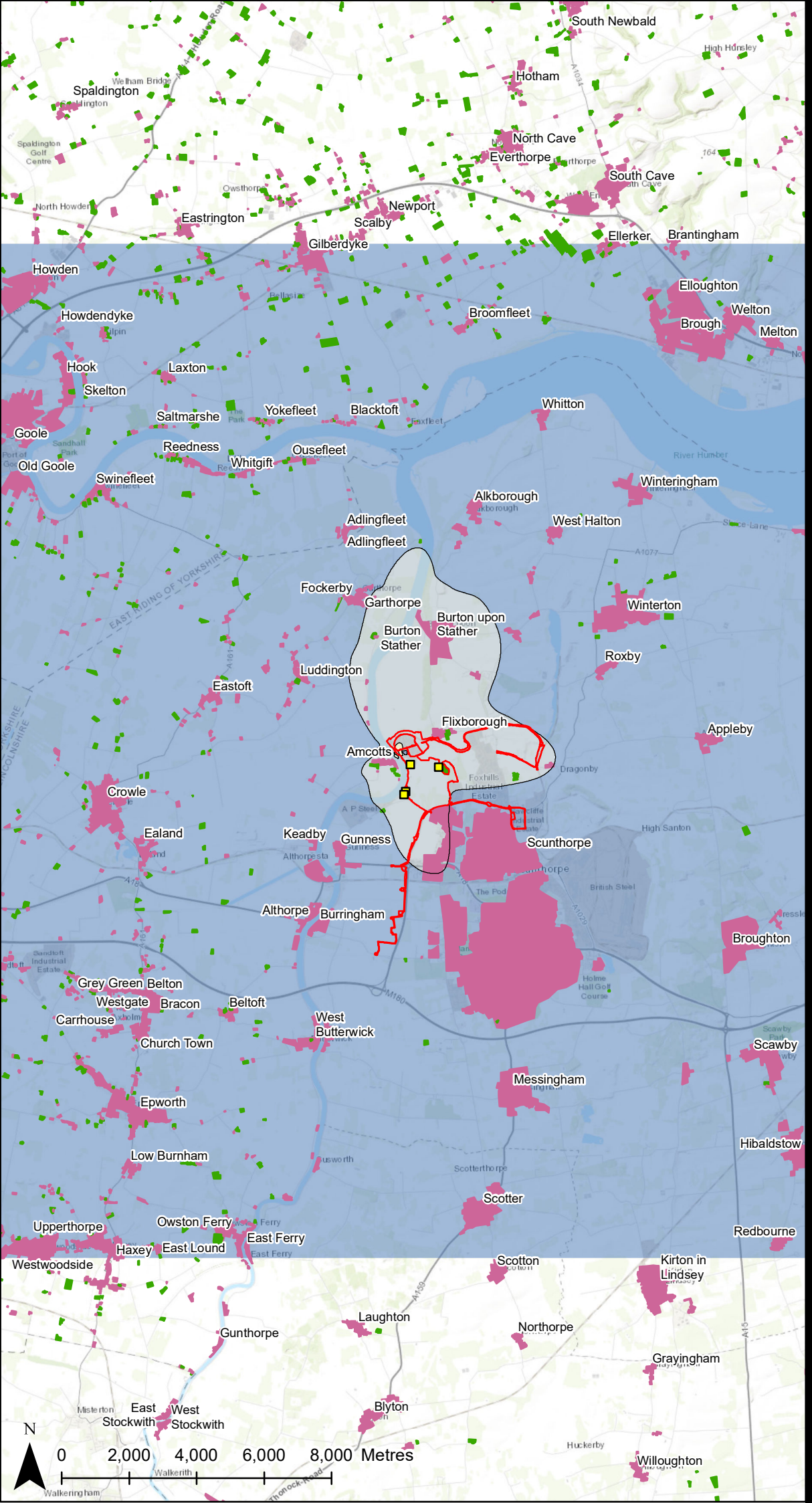
NO_2 Annual Mean Concentration (µg/m²) AQS 40

- < 0.4
- 0.4 - 2

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

DO NOT SCALE THIS DRAWING



NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 6 NO_x Annual Mean Contours

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	05/05/2023
Drawn by	MTC
Checked by	CHM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	150,000

ArcMap File

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AQ_ES_Contours_NOX_Annual_A01

Legend

- Human Receptor
- Order Limits
- Residential Receptor
- Farm Receptor

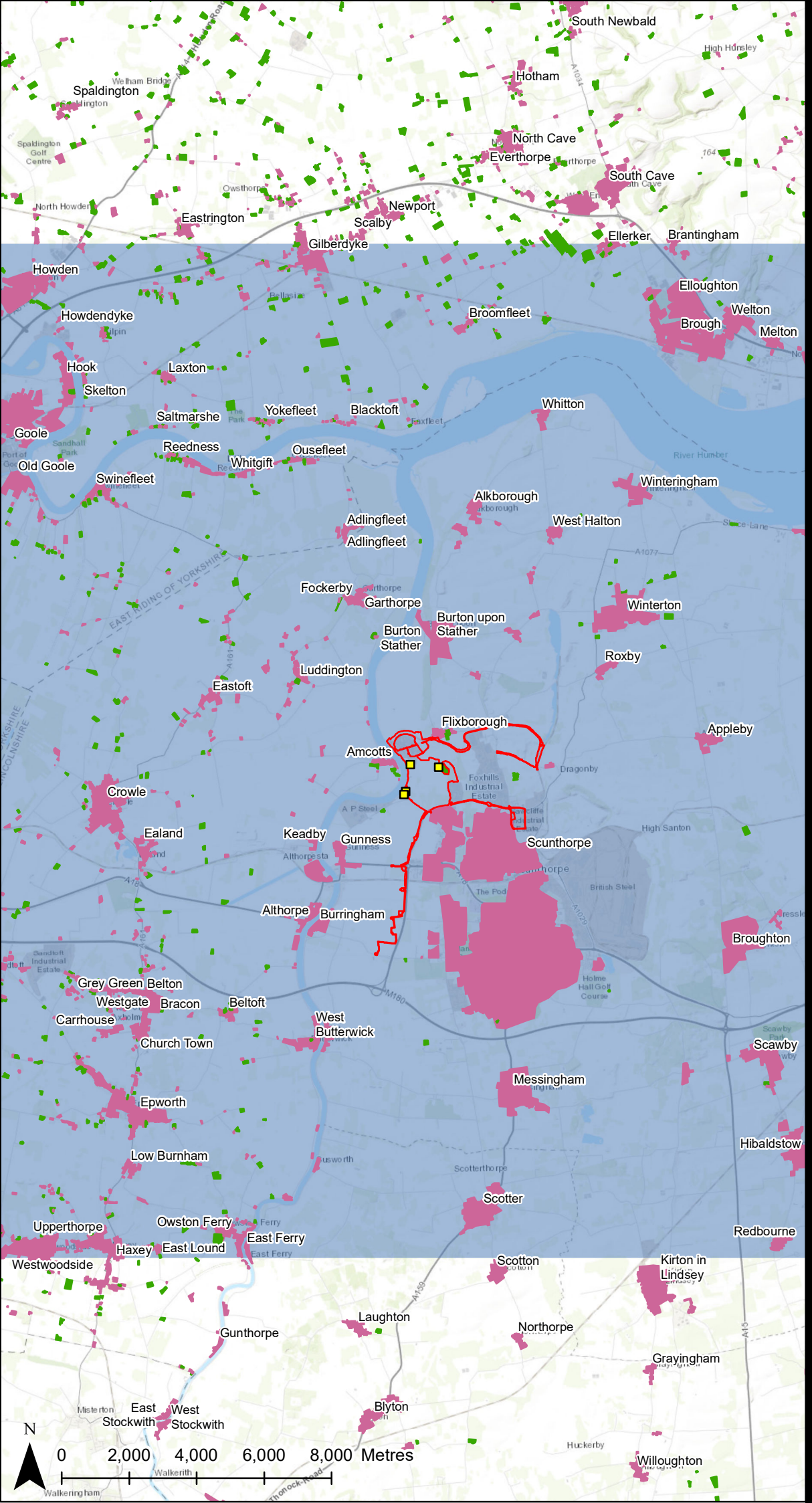
NO_x Annual Mean Concentration (µg/m²) AQS 30

- < 0.3
- 0.3 - 1.5
- 1.5 - 3

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

DO NOT SCALE THIS DRAWING



NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 7 PM_{10} 24 Hour Maximum Contours

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	05/05/2023
Drawn by	MTC
Checked by	CHM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	150,000

ArcMap File

\\uksprdgisfs01\Data\London\Confidential Projects\0483091 - Solar

AQ_ES_Contours_PM10_24_Hour_A01

Legend

- Human Receptor
- Order Limits
- Residential Receptor
- Farm Receptor

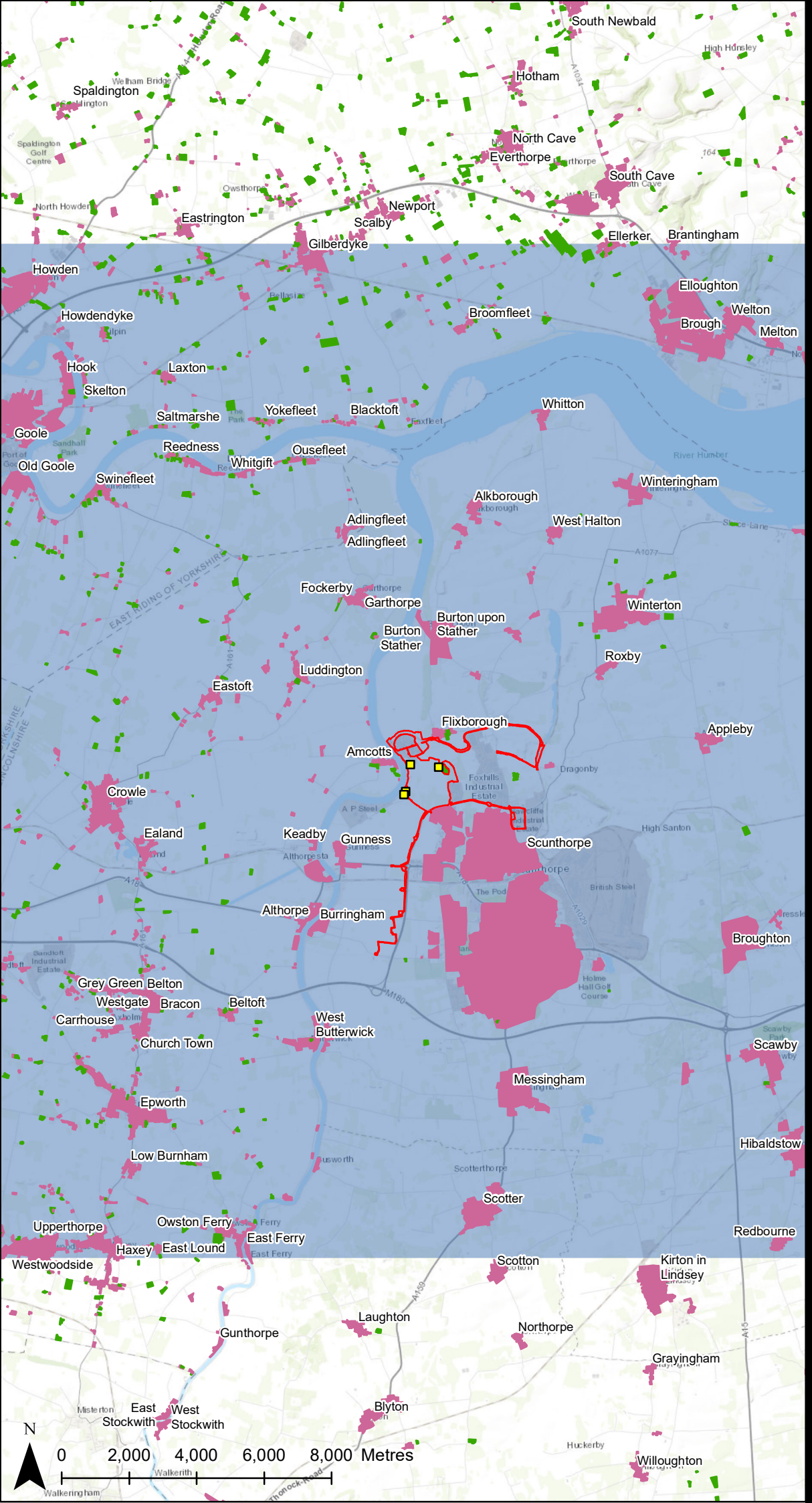
PM_{10} 24 hour Maximum Concentration ($\mu g/m^2$) AQS 50

- < 0.5

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

DO NOT SCALE THIS DRAWING



NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title	Figure 8 PM_{10} Annual Mean Contours

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	05/05/2023
Drawn by	MTC
Checked by	CHM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	150,000

ArcMap File

\\uksprdgisfs01\Data\London\Confidential Projects\0483091 - Solar

AQ_ES_Contours_PM10_Annual_A01

Legend

- Human Receptor
- Order Limits
- Residential Receptor
- Farm Receptor

PM_{10} Annual Mean Concentration (µg/m²) AQS 40

- < 0.4

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

DO NOT SCALE THIS DRAWING

APPENDIX B SITE SPECIFIC CRITICAL LOADS

Excel Spreadsheets Available on Request

APPENDIX C ASSESSMENT PARAMETER TABLES

Table 14: Dust Criteria

Source	Large	Medium	Small
Demolition	Total building volume >50,000m^3 Potentially dusty Material (e.g. concrete) Onsite crushing and Screening Demolition activities >20m above ground level.	Total building volume 20,000-50,000m^3 Potentially dusty material Demolition activities 10-20m above ground level.	Total building volume <20,000m^3 Construction material with low potential for dust release Demolition activities <10m above ground level Demolition during wetter months
Earthworks	Total site area >10,000m2 Potentially dusty soil type (e.g. clay) >10 heavy earth moving vehicles active at any one time Formation of bunds >8m in height Total material moved >100,000 tonnes	Total site area 2,500-10,000m2 Moderately dusty soil type (e.g. silt) 5 – 10 heavy earth moving vehicles active at any one time Formation of bunds 4-8m in height Total material moved 20,000-100,000 tonnes	Total site area <2,500m^2 Soil type with large grain size (e.g. sand) <5 heavy earth moving vehicles active at any one time Formation of bunds <4m in height Total material moved <20,000 tonnes Earthworks during wetter months
Construction	Total building volume >100,000m^3 Onsite concrete batching Sandblasting	Total building volume 25,000 – 100,000m^3 Potentially dusty construction material (e.g. concrete) Onsite concrete batching	Total building volume <25,000m^3 Material with low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HGV movements in any one day (a) Potentially dusty surface material (e.g. high clay content) Unpaved road length >100m	10 – 50 HGV movements in any one day (a) Moderately dusty surface material (e.g. silt) Unpaved road length 50 – 100m	< 10 HGV movements in any one day [(a)] Surface material with low potential for dust release Unpaved road length <50m

(a) HGV movements refer to outward trips (leaving the site) by vehicles of over 3.5 tonnes

Table 15: Model Approach and Parameters

Parameter	Approach	Notes
Dispersion model	ADMS 5, version 5	Stack models
	CERC, ADMS-Roads version 5	Traffic Model

Parameter	Approach	Notes
Model Domain	30km x 30km 20km x 20km (amines only)	Model grid domain centred at 486100, 414500
Receptor Grid resolution	50m (0-3km) 100m (3-7km) 250m (7km -15km)	The assessment considers both sensitive human receptors and habitats
	500m (amines only)	Due to the very long model run times for N-amines, the grid resolution for the N-amines models was decreased
Buildings	5 buildings on Site	Only included in Main ERF Stack model. Building dimensions and location presented in Table 16.
Terrain	Not required	There are no sustained gradients of >1:10 in the vicinity of the Site and therefore terrain was not included
Meteorological Data	Doncaster, 2014 - 2018	Hour-sequential data. Wind roses are presented in Figure 3 in Appendix A.
Surface Characteristics	Surface roughness: 0.4 (site) 0.1 (meteorological site)	Representative of mixed industrial and agricultural land use

Note:

The amine model runs include a time-dependant component. As such, under some circumstances this can lead to exceptionally long calculation times and very small concentrations that ca result in the model failing to complete. A smaller, lower resolution grid was used to minimise these model specific issues, however it is noted that the results presented are based upon the two out of five models that completed sucuesfully. The predicted impacts are of sufficiently small scale (<<1% of the EAL) that the use of the smaller grid, and use of 2 years of meteorological data will not have a bearing on the validity of the results when drawing conclusions relating to N-amines.

Table 16: Building Parameters (Main Stack Model)

Building	Centre Easting	Centre Northing	Length (m)	Width (m)	Height (m)
Bunker hall	486160	414413	39	85.2	50
Backup boilers hall	486138	414454	65	77.7	55
FGT hall	486122	414511	41	63.0	45
CC Pop-up	486089	414490	41	14.7	55
ACC/ABC	486184	414485	118	37.0	50

Table 17: Wind Turbine Model Inputs – Grange Wind Farm

<table>
<tr><th>Parameter</th><th>Value</th><th>Notes</th></tr>
<tr><td>Number of turbines</td><td>6</td><td>Grange Wind Farm located ~1km to the north of the Project site[18].</td></tr>
<tr><td>Wind Turbine power and model</td><td>2.05MW SENVION MM92</td><td></td></tr>
<tr><td>Hub Height</td><td>100m</td><td>Assumption, greatest height from wind-turbine models specifications sheet[19]</td></tr>
<tr><td>Diameter</td><td>92.5m</td><td>Taken from wind-turbine models specifications sheet</td></tr>
<tr><td>Locations of turbines</td><td><table><tr><th></th><th>X-Coord</th><th>Y- Coord</th></tr><tr><td>Turbine 1</td><td>486113</td><td>415496</td></tr><tr><td>Turbine 2</td><td>486179</td><td>415894</td></tr><tr><td>Turbine 3</td><td>485959</td><td>416156</td></tr><tr><td>Turbine 4</td><td>485800</td><td>416452</td></tr><tr><td>Turbine 5</td><td>486240</td><td>416542</td></tr><tr><td>Turbine 6</td><td>485881</td><td>416912</td></tr></table></td><td>Locations taken from mapping</td></tr>
<tr><td>Thrust Coefficient at each Wind Speed</td><td><table><tr><th>Wind Speed (m/s)</th><th>Thrust Coefficient</th></tr><tr><td>3</td><td>0.98</td></tr><tr><td>4</td><td>0.87</td></tr><tr><td>5</td><td>0.79</td></tr><tr><td>6</td><td>0.79</td></tr><tr><td>7</td><td>0.79</td></tr><tr><td>8</td><td>0.79</td></tr><tr><td>9</td><td>0.74</td></tr><tr><td>10</td><td>0.69</td></tr><tr><td>11</td><td>0.54</td></tr><tr><td>12</td><td>0.39</td></tr><tr><td>13</td><td>0.29</td></tr><tr><td>14</td><td>0.23</td></tr><tr><td>15</td><td>0.19</td></tr><tr><td>16</td><td>0.15</td></tr><tr><td>17</td><td>0.13</td></tr><tr><td>18</td><td>0.11</td></tr><tr><td>19</td><td>0.09</td></tr><tr><td>20</td><td>0.08</td></tr><tr><td>21</td><td>0.07</td></tr><tr><td>22</td><td>0.06</td></tr><tr><td>23</td><td>0.06</td></tr><tr><td>24</td><td>0.05</td></tr></table></td><td>Taken from Pierre-de-Saurel Wind Farm, Wind Resources Assessment (same turbine make and specs)[20]</td></tr>
</table>

[18] https://www.blue-energyco.com/our-projects/grange/

[19] https://en.wind-turbine-models.com/turbines/889-senvion-mm92

[20] https://eoliennespierredesaurel.com/wp-content/uploads/2018/05/PierreDeSaurel_WindResourceAssessment_20150427_v2.pdf

Table 18: Emission Parameters (Main ERF Stack)

Parameter	Unit	Value	
Number of stacks		1	
Number of flues per stack		3	3 flues, approx 2.55m apart (Lines 1 – 3)
Stack height actual	m	120	
Flue diameter	m	2.47	
Emission velocity	m/s	15.99	
Volume flow rate Actual	Am^3/s	76.77	Per stack
Volume flow rate Normalised per stack	Nm^3/s	56.51	Per stack
Emission temperature (actual)	Celsius	130	
Flue Easting	m	Line 1: 486115 Line 2: 486118 Line 3: 486118	
Flue Northing	m	Line 1: 414518 Line 2: 414516 Line 3: 414519	
Hours of operation		8760	

Pollutant	Emission concentration (mg/Nm^3)	Mass emission (g/s) per stack
SO_2	30	1.70
NO_x	120	6.78
CO	10	0.565
PM_{10}	5.0	0.283
HCl	6.0	0.339
HF	1.0	$5.65X10^{-2}$
Cd	0.020	$1.13X10^{-3}$
Tl	0.020	$1.13X10^{-3}$
Hg	$7.00X10^{-6}$	$3.96X10^{-7}$
Sb	$1.50X10^{-3}$	$8.48X10^{-5}$
As	$1.00X10^{-3}$	$5.65X10^{-5}$
total Cr	$8.50X10^{-3}$	$4.80X10^{-4}$
Cr VI+	$5.00X10^{-5}$	$2.83X10^{-6}$
Co	$1.00X10^{-3}$	$5.65X10^{-5}$
Cu	$7.50X10^{-3}$	$4.24X10^{-4}$
Pb	$1.10X10^{-2}$	$6.22X10^{-4}$
Mn	$1.70X10^{-2}$	$9.61X10^{-4}$

Ni	$1.50X10^{-2}$	$8.48X10^{-4}$
V	$5.00X10^{-4}$	$2.83X10^{-5}$
PAH	$2X10^{-4}$	$1.13X10^{-5}$
NH_3	10	0.565
Dioxins	$6.00X10^{-8}$	$3.39X10^{-9}$
VOCs	10	0.565
Dioxin-like PCBs	$8.00X10^{-8}$	$4.52X10^{-9}$
PCBs	0.005	$2.83X10^{-4}$

Note 1: factored using EA metals guidance
Note 2: carbon capture model detailed below.

Table 19: Back-up Generator Emission Parameters

Parameter	Unit	Value	
Number of stacks		1	
Number of flues per stack		1	
Stack height actual	m	55	
Flue diameter	m	0.84	
Emission velocity	m/s	15	
Volume flow rate Actual	Am^3/s	8.3	
Emission temperature (actual)	Celsius	140	
Flue Easting	m	486117	
Flue Northing	m	414434	
Hours of operation		12 hours per year	Hours required for testing
Nitrogen oxides	g/s	0.48	

Table 20: Back up Boilers Emission Parameters

Parameter	Unit	Value	
Number of stacks		1	
Number of flues per stack		3	3 flues, approx. 1 m apart (Boilers 1 – 3)
Stack height actual	m	53	
Flue diameter	m	Boiler 1: 0.7 Boiler 2: 0.66 Boiler 3: 0.66	
Emission velocity	m/s	15	
Volume flow rate Actual	Am^3/s	Boiler 1: 4.68 Boiler 2: 4.04 Boiler 3: 4.04	

Parameter	Unit	Value	
Emission temperature (actual)	Celsius	140	
Flue Easting	m	Boiler 1: 486146 Boiler 2: 486147 Boiler 3: 486146	
Flue Northing	m	Boiler 1: 414532 Boiler 2: 414532 Boiler 3: 414533	
Nitrogen oxides	g/s	Boiler 1: 0.250 Boiler 2: 0.210 Boiler 3: 0.210	

Table 21: Ship Emission Parameters

Parameter	Unit	Value	
Number of stacks		1	
Number of flues per stack		1	
Stack height actual	m	11.8	
Flue diameter	m	0.11	
Emission velocity	m/s	205	
Volume flow rate Actual	Am^3/s	2	
Emission temperature (actual)	Celsius	554	
Flue Easting	m	485902	
Flue Northing	m	414443	
Nitrogen oxides	g/s	3.21	Calculated from engine speed (900 rpm) and capacity ~1MWthermal, based upon a Tier 1 engine

Table 22: Rail Emission Parameters

Parameter	Unit	Value	
Number of stacks		200	200 sources along length of proposed railhead. Sources ordered south to north along proposed railhead design spaced at 6.67m (Rail_1 to Rail_200)
Number of flues per stack		1	

Parameter	Unit	Value	
Stack height actual	m	3.9	
Flue diameter	m	0.28	
Emission velocity	m/s	205	
Volume flow rate Actual	Am^3/s	12.7	
Emission temperature (actual)	Celsius	554	
Flue Easting	m	485902	
Flue Northing	m	414443	
Nitrogen oxides	g/s	0.00554	As total emissions

Table 23: Rail Source Locations

Source ID	X	Y
Rail_1	486303.82	413454.06
Rail_2	486303.29	413460.71
Rail_3	486302.76	413467.36
Rail_4	486302.24	413474.02
Rail_5	486301.71	413480.67
Rail_6	486301.19	413487.32
Rail_7	486300.66	413493.97
Rail_8	486300.14	413500.62
Rail_9	486299.61	413507.27
Rail_10	486299.08	413513.92
Rail_11	486298.56	413520.57
Rail_12	486298.03	413527.22
Rail_13	486297.51	413533.87
Rail_14	486296.98	413540.52
Rail_15	486296.46	413547.18
Rail_16	486295.93	413553.83
Rail_17	486295.41	413560.48
Rail_18	486294.88	413567.13
Rail_19	486294.35	413573.78
Rail_20	486293.83	413580.43
Rail_21	486293.30	413587.08
Rail_22	486292.78	413593.73
Rail_23	486292.25	413600.38

Source ID	X	Y
Rail_24	486291.73	413607.03
Rail_25	486291.20	413613.68
Rail_26	486290.67	413620.33
Rail_27	486290.15	413626.99
Rail_28	486289.62	413633.64
Rail_29	486289.10	413640.29
Rail_30	486288.57	413646.94
Rail_31	486288.05	413653.59
Rail_32	486287.52	413660.24
Rail_33	486287.00	413666.89
Rail_34	486286.47	413673.54
Rail_35	486285.94	413680.19
Rail_36	486285.42	413686.84
Rail_37	486284.89	413693.49
Rail_38	486284.37	413700.14
Rail_39	486283.84	413706.80
Rail_40	486283.32	413713.45
Rail_41	486282.79	413720.10
Rail_42	486282.26	413726.75
Rail_43	486281.74	413733.40
Rail_44	486281.21	413740.05
Rail_45	486280.69	413746.70
Rail_46	486280.16	413753.35
Rail_47	486279.64	413760.00
Rail_48	486279.11	413766.65
Rail_49	486278.59	413773.30
Rail_50	486278.06	413779.95
Rail_51	486277.53	413786.61
Rail_52	486277.01	413793.26
Rail_53	486276.48	413799.91
Rail_54	486275.96	413806.56
Rail_55	486275.43	413813.21
Rail_56	486274.91	413819.86

Source ID	X	Y
Rail_57	486274.38	413826.51
Rail_58	486273.85	413833.16
Rail_59	486273.33	413839.81
Rail_60	486272.80	413846.46
Rail_61	486272.28	413853.11
Rail_62	486271.75	413859.76
Rail_63	486271.23	413866.42
Rail_64	486270.70	413873.07
Rail_65	486270.17	413879.72
Rail_66	486269.65	413886.37
Rail_67	486269.12	413893.02
Rail_68	486268.60	413899.67
Rail_69	486268.07	413906.32
Rail_70	486267.55	413912.97
Rail_71	486267.02	413919.62
Rail_72	486266.50	413926.27
Rail_73	486265.97	413932.92
Rail_74	486265.44	413939.58
Rail_75	486264.92	413946.23
Rail_76	486264.39	413952.88
Rail_77	486263.72	413959.51
Rail_78	486262.97	413966.14
Rail_79	486261.88	413972.72
Rail_80	486260.64	413979.28
Rail_81	486259.18	413985.79
Rail_82	486257.47	413992.23
Rail_83	486255.65	413998.65
Rail_84	486253.47	414004.96
Rail_85	486251.18	414011.22
Rail_86	486248.64	414017.39
Rail_87	486246.00	414023.52
Rail_88	486243.29	414029.61
Rail_89	486240.57	414035.71

Source ID	X	Y
Rail_90	486237.86	414041.80
Rail_91	486235.15	414047.90
Rail_92	486232.43	414053.99
Rail_93	486229.72	414060.08
Rail_94	486227.00	414066.18
Rail_95	486224.29	414072.27
Rail_96	486221.57	414078.37
Rail_97	486218.86	414084.46
Rail_98	486216.14	414090.56
Rail_99	486213.43	414096.65
Rail_100	486210.71	414102.74
Rail_101	486208.00	414108.84
Rail_102	486205.29	414114.93
Rail_103	486202.57	414121.03
Rail_104	486199.86	414127.12
Rail_105	486197.14	414133.22
Rail_106	486194.43	414139.31
Rail_107	486191.71	414145.40
Rail_108	486189.00	414151.50
Rail_109	486186.28	414157.59
Rail_110	486183.57	414163.69
Rail_111	486180.85	414169.78
Rail_112	486178.14	414175.88
Rail_113	486175.43	414181.97
Rail_114	486172.71	414188.07
Rail_115	486170.00	414194.16
Rail_116	486167.28	414200.25
Rail_117	486164.57	414206.35
Rail_118	486161.85	414212.44
Rail_119	486159.14	414218.54
Rail_120	486156.42	414224.63
Rail_121	486153.71	414230.73
Rail_122	486150.99	414236.82

Source ID	X	Y
Rail_123	486148.28	414242.91
Rail_124	486145.57	414249.01
Rail_125	486142.85	414255.10
Rail_126	486140.14	414261.20
Rail_127	486137.35	414267.26
Rail_128	486134.47	414273.28
Rail_129	486131.34	414279.16
Rail_130	486128.10	414285.00
Rail_131	486124.56	414290.65
Rail_132	486120.91	414296.23
Rail_133	486117.06	414301.68
Rail_134	486113.00	414306.98
Rail_135	486108.85	414312.20
Rail_136	486104.42	414317.19
Rail_137	486099.89	414322.08
Rail_138	486095.19	414326.82
Rail_139	486090.41	414331.46
Rail_140	486085.58	414336.07
Rail_141	486080.75	414340.67
Rail_142	486075.92	414345.27
Rail_143	486071.09	414349.88
Rail_144	486066.26	414354.48
Rail_145	486061.43	414359.08
Rail_146	486056.60	414363.69
Rail_147	486051.77	414368.29
Rail_148	486046.94	414372.89
Rail_149	486042.11	414377.50
Rail_150	486037.28	414382.10
Rail_151	486032.45	414386.70
Rail_152	486027.63	414391.31
Rail_153	486022.80	414395.91
Rail_154	486017.97	414400.51
Rail_155	486013.14	414405.11

Source ID	X	Y
Rail_156	486008.31	414409.72
Rail_157	486003.48	414414.32
Rail_158	485998.65	414418.92
Rail_159	485993.82	414423.53
Rail_160	485988.99	414428.13
Rail_161	485984.16	414432.73
Rail_162	485979.33	414437.34
Rail_163	485974.50	414441.94
Rail_164	485969.67	414446.54
Rail_165	485964.85	414451.15
Rail_166	485960.02	414455.75
Rail_167	485955.19	414460.35
Rail_168	485950.36	414464.95
Rail_169	485945.53	414469.56
Rail_170	485940.70	414474.16
Rail_171	485935.87	414478.76
Rail_172	485931.04	414483.37
Rail_173	485926.21	414487.97
Rail_174	485921.38	414492.57
Rail_175	485916.55	414497.18
Rail_176	485911.72	414501.78
Rail_177	485906.89	414506.38
Rail_178	485902.07	414510.99
Rail_179	485897.24	414515.59
Rail_180	485892.41	414520.19
Rail_181	485887.58	414524.80
Rail_182	485882.79	414529.44
Rail_183	485878.12	414534.20
Rail_184	485873.66	414539.16
Rail_185	485869.33	414544.23
Rail_186	485865.33	414549.57
Rail_187	485861.48	414555.02
Rail_188	485857.85	414560.62

Source ID	X	Y
Rail_189	485854.52	414566.40
Rail_190	485851.34	414572.26
Rail_191	485848.48	414578.29
Rail_192	485845.86	414584.42
Rail_193	485843.41	414590.62
Rail_194	485841.16	414596.90
Rail_195	485838.91	414603.18
Rail_196	485836.66	414609.47
Rail_197	485834.42	414615.75
Rail_198	485832.17	414622.03
Rail_199	485829.92	414628.31
Rail_200	485827.68	414634.59

Table 24: Road Model Parameters

Parameter	Unit	Light duty vehicle	Heavy duty vehicles
Average Speed	Km/hr	65	65
Vehicles per hour (total traffic not ERF traffic)	65	178	326
Road Width	m	6	

Table 25: Road Model Vertices

Road Name	X (m)	Y (m)
6_New_Access_Road	486456.8	414311.6
	486484.6	414222.1
	486491.2	414195.3
	486508.1	414128.2
	486509.1	414056.7
	486510.7	413985.2
	486508.4	413879.3
	486509.1	413819.5
	486508.1	413706.5
	486508.4	413558.2
	486509.1	413306.7
	486508.7	413213.8
	486509.1	413092.3
	486509.1	412928.6

Table 26: Amine Model Parameters

Parameter	Unit	Value	Notes
NO_x	g/s	20.3	Vendor data
Amine	g/s	$6.04x10^{-3}$	Vendor data
Nitrosamine	g/s	$1.20x10^{-6}$	Vendor data
Nitramine	g/s	$3.90x10^{-6}$	Vendor data
Amine		Monoethanolamine (MEA)	
k1 = Amine/OH radical reaction rate constant	$cm^3\ mol^{-1}\ s^{-1}$ $ppb^{-1}\ s^{-1}$	$1.60x10^{-13}$ $4.01x10^{-3}$	Nielsen (2010)
k2 = Amino radical/O2 reaction rate constant	$cm^3\ mol^{-1}\ s^{-1}$ $ppb^{-1}\ s^{-1}$	$1.2x10^{-19}$ $3.01x10^{-9}$	Nielsen (2010)
k3 = Rate constant for formation of nitrosamine	$cm^3\ mol^{-1}\ s^{-1}$ $ppb^{-1}\ s^{-1}$	$2.90x10^{-11}$ 0.726	Nielsen (2010)
k4a = Rate constant for formation of nitramine	$cm^3\ mol^{-1}\ s^{-1}$ $ppb^{-1}\ s^{-1}$	$3.18x10^{-13}$ 0.00797	Nielsen (2011), for DMA
k4 = Amino radical/NO2 reation rate constant	$cm^3\ mol^{-1}\ s^{-1}$ $ppb^{-1}\ s^{-1}$	$3.72x10^{-12}$ 0.0932	Nielsen (2010)
Branching Ratio	$cm^3\ mol^{-1}\ s^{-1}$ $ppb^{-1}\ s^{-1}$	0.08	Nielsen (2012)
Ratio of J(nitrosamine) to NO2	Dimension-less	0.53	Nielsen (2010)
OH concentration constant c (site specific)	Dimension-less	0.00052	Based on CERC method
Atmospheric oxygen concentration	ppb	209406000	CERC
Baseline NO_x [1]	$\mu g/m^3$	13.5	
Baseline NO_2 [2]	$\mu g/m^3$	10.2	

Note 1: reactions within stack NO_x are calculated using the NO_x emission values. The NO_x and NO_2 baseline values are the 'true' baseline, without the ERF emission points.

References:
Nielsen (2010) Atmospheric degredation of amines: summary report: gas-phase photo-oxidation of 2-aminoethanol (MEA)
Nielsen (2011) Atmospheric degredation of amines: summary report: photo-oxidation of methylamine, dimethylamine and trimethylamine
Nielsen (2012) Atmospheric chemistry and environmental impact of the use of amines in carbon capture and storage (CCS) Chem. Soc. Rev. 2012 41 6684-6704

Table 27: Location of Sensitive Habitat Receptors

ID	Receptor	Type	Approximate Location relative to Site
H1	Phoenix	LNR	1.1 km east
H2	Phoenix Parkway	LNR	1.1 km east
H3	Burton Wood, Burton upon Stather	LWS	1.2 km north
H4	Paupers' Drain	LWS	1.5 km northwest
H5	Slag Banks	LWS	1.4 km northwest
H6	Humber Estuary	SAC	Adjacent to western boundary

ID	Receptor	Type	Approximate Location relative to Site
H7	Humber Estuary	SPA	6.8 km north
H8	Humber Estuary	SSSI	Adjacent to western boundary
H9	Crowle Borrow Pits	SSSI	8.0 km southwest
H10	Conesby (Yorkshire East) Quarry (no assessed, geological)	SSSI	8 km south
H11	Eastoft Meadow	SSSI	7.6 km west
H12	Hadfield Chase Ditches	SSSI	8.0 km southwest
H13	Risby Warren	SSSI	4.8 km east
H14	Broughton Far Wood	SSSI	10.5km east
H15	Messingham Heath	SSSI	11km south
H16	Messingham Sand Quarry	SSSI	12.1km south
H17	Manton Stone Quarry	SSSI	14.4km southeast
H18	Castlethorpe Tufas	SSSI	13.5km southeast
H19	Manton and Twigmoor	SSSI	11km southeast
H20	Tuetoes Hills	SSSI	12.7km south
H21	Thorne, Crowle and Goole Moors	SSSI	10km west
H22	Scotton and Laughton Forest Ponds	SSSI	14.5km south
H23	Epworth Turbary	SSSI	14.7km southwest
H24	South Ferriby Chalk Pit	SSSI	14.5km northeast
H25	Thorne Moor	SAC	10km west
H26	Thorne and Hatfield Moors	SPA	10km west

Table 28: Dry Deposition Velocity (m/s)

Pollutant	Grassland	Woodland
Nitrogen Dioxide (NO^2)	0.0015	0.0030
Sulphur Dioxide (SO^2)	0.012	0.024
Hydrogen Chloride (HCl)	0.025	0.06
Ammonia (NH^3)	0.02	0.03