CONTENTS

TABLES

8.0 AIR QUALITY

8.1 Introduction

8.1.1 This chapter of the Environmental Statement (ES) addresses the potential air quality effects of the Proposed Development.

8.1.2 Impacts during the construction, operation and decommissioning phases of the Proposed Development are assessed. In particular, the chapter considers potential impacts on identified human health and ecological receptors in terms of:

- dust generation during construction;
- emissions from road traffic and Non-Road Mobile Machinery (NRMM) during construction;
- process emissions from the operational phase of the Proposed Development; and
- the potential effects of the eventual decommissioning of the Proposed Development.

8.1.3 This chapter is supported by:

- **Appendix 8A**: Air Quality – Construction Phase;
- **Appendix 8B**: Air Quality – Operational Phase;
- **Appendix 8C**: Air Quality - Assessment of Amine Degradation Products; and
- **Figures 8.1 to 8.9** (ES Volume III).

8.1.4 Appendices are presented in ES Volume II (**Application Document Ref. 6.3**) and Figures are presented in ES Volume III (**Application Document Ref. 6.4**).

8.2 Legislation, Planning Policy and Guidance

Legislative Background

Air Quality Legislation

8.2.1 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010 ('the 2010 Regulations'), which transpose the requirements of the European Ambient Air Quality Directive 2008 (European Commission, 2008) and the 2004 fourth Air Quality Daughter Directive (European Commission, 2004). The 2010 Regulations set air quality limits for a number of major air pollutants that have the potential to impact public health, such as nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM_{10}, which is particulate matter of 10 micrometres (µm) diameter or less). The 2010 Regulations also include an exposure reduction

objective for $PM_{2.5}$ in urban areas and a national target value for $PM_{2.5}$ ($PM_{2.5}$ is particulate matter of 2.5µm diameter or less).

8.2.2 The Environment Act 1995 ('the Environment Act') requires the UK Government to produce a National Air Quality Strategy (NAQS), last reviewed in 2007 (Department for Environment, Food and Rural Affairs (Defra), 2007), containing air quality objectives and timescales to meet those objectives. These objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor or in-vehicle exposure. The human health objectives that are applicable to this assessment are set out in Table 8.1.

Table 8.1: National Air Quality Strategy objectives (NAQS) – Protection of Human Health

Pollutant	Source	Concentration (µg/m^3)	Measured as
Nitrogen dioxide (NO_2)	EU air quality limit value	40	Annual mean
		200	1-hour mean, not to be exceeded more than 18 times a year
Particulate matter (PM_{10})	EU air quality limit value	40	Annual mean
		50	24-hour mean, not to be exceeded more than 35 times a year
Particulate matter ($PM_{2.5}$)	EU air quality target value	25	Annual mean
Carbon monoxide (CO)	EU air quality limit value	10,000	Maximum daily running 8-hour mean

8.2.3 The Environment Act requires local authorities to undertake an assessment of local air quality to establish whether the objectives are being achieved, and to designate Air Quality Management Areas (AQMA) if improvements are necessary to meet the objectives. Where an AQMA has been designated, the local authority must draw up an Air Quality Action Plan (AQAP) describing the measures that will be put in place to assist in achieving the objectives. Defra has responsibility for coordinating assessments and AQAP for the UK as a whole.

8.2.4 No AQMA have been declared for the Proposed Development Site or surrounding nearby areas. The nearest is within the study area, approximately 6.2km to the east of the Proposed Development Site in Scunthorpe and is designated for the exceedance of the 24-hour PM_{10} limit value. Based on Defra forecast models and local authority monitoring data, no exceedances of the EU

standards have been identified in the vicinity of the Proposed Development Site.

8.2.5 The impact of emissions from the Proposed Development on sensitive ecological receptors are quantified within this assessment in two ways:

- as direct impacts arising due to increases in atmospheric pollutant concentrations, assessed against defined 'critical levels'; and
- as indirect impacts arising through deposition of acids and nutrient nitrogen to the ground surface, assessed against defined 'critical loads'.

8.2.6 The critical levels for the protection of vegetation and ecosystems are defined as "*concentrations of pollutants in the atmosphere above which direct adverse effects on...plants [and] ecosystems...may occur according to present knowledge,*" and critical loads are defined as *"a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"* (Centre for Ecology and Hydrology (CEH) and Air Pollution Information System (APIS) website).

8.2.7 The critical levels applied in this assessment are set out in Table 8.2 and apply regardless of the habitat type present at the habitat receptor. In the case of ammonia (NH_3), the greater sensitivity of lichens and bryophytes to this pollutant is reflected in the application of two critical levels, with a stricter critical level to be applied to locations where such species are present.

Table 8.2: Critical Levels (CL) – Protection of Vegetation and Ecosystems

Pollutant	Source	Concentration ($\mu g/m^3$)	Measured as
Oxides of nitrogen (NO_x)	EU air quality limit value	30	Annual mean
	UK target value	75	Daily mean
Ammonia (NH_3)	UK target value for lichen and bryophytes	1	Annual mean
	UK target value	3	Annual mean

8.2.8 Critical load criteria for the deposition of nutrient nitrogen and acidifying species are dependent on the habitat type and species present and are specific to the sensitive receptors considered within the assessment. The critical loads are detailed on the APIS website (CEH and APIS). The critical load criteria adopted for the sensitive ecological receptors considered in the assessment are presented in **Appendix 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**).

Industrial Emissions Directive

8.2.9 The EU's Industrial Emissions Directive (IED) (European Commission, 2010) provides operational limits and controls to which regulated plant must comply, including Emission Limit Values (ELV) for pollutant releases into the air. The Combined Cycle Gas Turbine (CCGT) of the Proposed Development falls under the Large Combustion Plant (LCP) requirements (Chapter III) of the IED, since it will have a capacity of greater than 50MW thermal input.

8.2.10 The operator of a plant covered by the IED is required to employ Best Available Techniques (BAT) for the prevention or minimisation of emissions to the environment, to ensure a high level of protection of the environment as a whole. European BAT reference documents ('BRefs') are published for each industrial sector under the IED, and they include BAT-Associated Emission Levels (BAT-AEL) which are expected to be met through the application of BAT. These levels may be the same as those published in the IED, or they may be more stringent. The current (2017) version of the LCP BRef (European Commission, 2017) includes annual average BAT-AEL for NO_x and an indicative value for CO from gas turbines which are more stringent than the ELV included in the IED.

8.2.11 As an emerging technology, there is currently no finalised BRef or BAT guidance document available for carbon capture plant (CCP), and therefore no BAT-AEL have been defined for the activity to date. The Environment Agency is currently preparing BAT guidance for Post-Combustion Carbon Dioxide Capture using Amine-Based Technologies (Environment Agency 2021 DRAFT), which is due to be published mid-2021, however this does not propose any BAT-AEL at this stage as it is intended that these will be developed once CCP becomes operational in the UK, and collated monitoring data can confirm suitable levels for which the BAT-AEL should be set.

8.2.12 The emission limits assessed for the Proposed Development are discussed in **Appendix 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**).

Environmental Permitting Regulations

8.2.13 The Environmental Permitting (England and Wales) Regulations 2016 (EPR) apply to all new installations and transpose the requirements of the IED into UK legislation. Both combustion activities and carbon capture and storage activities are listed activities under the EPR, and therefore they require an Environmental Permit to operate, issued by the Environment Agency. Performance against the relevant ELV or BAT-AEL, as defined in the IED and associated BRefs, would be regulated through the Environment Permit.

8.2.14 Where legislative ambient air quality limits or objectives are not specified for the pollutant species potentially released from the Proposed Development, Environmental Assessment Levels (EAL), published in the Environment Agency's Risk Assessments for Specific Activities: Environmental Permits guidance, referred to as the 'Agency's guidance' (Defra and Environment

Agency, 2016) can be used to assess potential health effects on the general population. This includes an additional EAL for hourly concentrations of CO and annual average and hourly EAL for NH_3, which can result from the operational CCGT plant.

8.2.15 As well as the combustion emissions from the operational CCGT plant, emissions of secondary and tertiary amines and their breakdown products could occur from the CCP absorber stack(s) and potentially their breakdown (oxidation) products could occur in the atmosphere. Such pollutant species are not included in the latest version of the Environment Agency's Risk Assessment guidance; however, the Environment Agency has confirmed during consultation on the Proposed Development that a recommended EAL has recently undergone public consultation for Mono-ethanolamine (MEA). The consultation closed on the 7th February 2021 and the EALs were formally adopted on 19th May 2021. Although MEA has not been confirmed as the carbon capture solvent to be used in the operational Proposed Development, it is likely that this could form the basis of any solvent solution used or could be used as an appropriate surrogate species. Therefore, in the absence of further information, this recommended EAL has been used for the assessment of the impacts of amine emissions from the Proposed Development.

8.2.16 It is also known that some amines can potentially degrade (thermally and chemically react with oxygen) and form nitrosamines and nitramines (collectively referred to as N-amines) both during the carbon capture process itself and also in the environment, following release. Therefore, the impacts of both directly released N-amines and the N-amines produced through atmospheric degradation of released amines have also been considered in the assessment provided in **Appendix 8C:** Amines and their Degradation Products (ES Volume II – **Application Document Ref. 6.3**).

8.2.17 Again, no EALs for N-amines in the atmosphere for the UK are included in the latest version of the Environment Agency's Risk Assessment guidance, the Environment Agency has recently consulted on a proposed EAL for N-nitrosodimethylamine (NDMA), of 0.2 nanograms (ng)/m^3 which has been formally adopted on 19th May 2021. It is understood that NDMA has been used for the EAL, as this is considered to be one of the most harmful nitrosamines, and therefore results in a conservative EAL. In addition, it is understood that the Environment Agency propose to compare the total nitrosamine concentration from plant emissions with the NDMA EAL, although it should be recognised that some of the degradation products will be less harmful, and therefore this is a very conservative assumption.

8.2.18 Other degradation products, such as aldehydes and ketones may also result from the CCP absorber stack(s), depending on the amine solvent used, and therefore these have also been included in the assessment. The EAL applicable for this assessment for the protection of human health are presented in Table 8.3.

Table 8.3: Environmental Assessment Levels (EAL) – human health

Pollutant	Concentration (µg/m^3)	Measured as	Source of EAL
CO	30,000	Hourly mean	EA Risk Assessment Guidance.
Ammonia (NH_3)	180	Annual mean	
	2,500	Hourly mean	
Amines (as MEA)	400	Hourly mean	Environment Agency proposed EAL
	100	24 hour mean	
Nitrosamines	0.2ng/m^3	Annual mean	Environment Agency proposed EAL
Acetaldehyde	9,200	Hourly mean	EA Risk Assessment Guidance.
	370	Annual mean	
Formaldehyde	100	Hourly mean	
	5	Annual mean	
Ketones[1]	89,500	Hourly mean	
	6,000	Annual mean	

[1] EAL for Methyl ethyl ketone used, as the lowest EAL of any ketone listed in the Environment Agency Risk Assessment Guidance, therefore ensuring a conservative assessment.

8.2.19 Throughout the remainder of this chapter and the associated technical appendices, NAQS objectives, critical levels and EAL are collectively referred to as Air Quality Assessment Levels (AQAL).

Sensitive ecosystems

8.2.20 The UK is bound by the terms of Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora ('Habitats Directive'), Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds ('Wild Birds Directive') and the Convention on Wetlands of International Importance especially as Wildfowl Habitats ('Ramsar sites') (United Nations, 1994). The Conservation of Habitats and Species Regulations 2017 as amended ('the 2017 Regulations') provide for the protection of European Sites created under these, i.e. Special Areas of Conservation (SAC) designated pursuant to the Habitats Directive and Special Protection Areas (SPA) and provisional SPA (pSPA) classified under the Wild Birds Directive. Specific provisions of the European Directives are also applied to SAC, and candidate SAC (cSAC), which requires these sites to be given special consideration, and for further assessment to be undertaken for any development which is likely to lead to a significant effect upon them. Special consideration within this quality chapter has also been given to SPA, pSPA and Ramsar sites.

Planning Policy Context

National Planning Policy

8.2.21 National Policy Statements (NPS) are, where in place, the primary basis for the assessment and determination of applications for Nationally Significant Infrastructure Projects (NSIP), such as the Proposed Development. The Overarching National Policy Statement on Energy EN-1 ('NPS EN-1') (Department of Energy and Climate Change (DECC), 2011) states that:

"*The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest…Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health*.

In considering an application for development consent, the IPC [Secretary of State] should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes…will be properly applied and enforced by the relevant regulator" (paragraphs 4.10.2-4.10.3).

8.2.22 NPS EN-1 (DECC, 2011a) requires the consideration of significant air emissions, their mitigation and any residual effects, the predicted absolute emission levels after application of mitigation, the relative change in air quality from existing concentrations and any potential eutrophication impacts as a result of the Proposed Development project stages, including contributions from additional road traffic. Where a project could result in deterioration in air quality in an area where national air quality limits are not being met or may lead to a new area breaching national air quality limits, or where substantial changes in air quality concentrations are predicted, such effects would be expected to be given substantial weight in consideration of the acceptability of the proposal. Where a project is likely to lead to a breach of statutory air quality limits, the developer should work with the relevant authorities to secure appropriate mitigation measures to allow the proposal to proceed.

8.2.23 The Overarching National Policy Statement for Fossil Fuel Electricity Generating Infrastructure EN-2 (DECC, 2011b) states:

"Fossil fuel generating stations are likely to emit nitrogen oxides (NO_x) and sulphur oxides (SO_x), although SO_x emissions from gas-fired generating stations may be negligible. To meet the requirements of the Large Combustion Plant Directive (LCPD) and the Industrial Emissions Directive (IED) when it comes into force, fossil fuel generating stations must apply a range of mitigation

to minimise NO_x and other emissions."
(paragraph 2.5.3)

8.2.24 Table 8.4 provides a summary of relevant NPS advice regarding air quality and emissions and presents an assessment of where matters are assessed within this chapter.

Table 8.4: Summary of relevant NPS advice regarding air quality and emissions

Summary of NPS	Consideration within the Chapter
NPS EN-1	
Paragraph 5.2.1 states: *"Air emissions include particulate matter (for example dust) up to a diameter of ten microns (PM_{10}) as well as gases such as sulphur dioxide, carbon monoxide and nitrogen oxides (NO_x). Levels for pollutants in ambient air are set out in the Air Quality Strategy which in turn embodies EU legal requirements. The Secretary of State for the Environment Food and Rural Affairs is required to make available up to date information on air quality to any relevant interested party".*	Particulate emissions as well as those of NO_x have been included in the assessment of construction, traffic and operational air impacts. Carbon monoxide emissions have also been considered in the Environmental Statement (ES). Sulphur dioxide emissions are negligible from a gas-fired power station. Consideration has also been given to baseline air quality conditions in the locality.
Paragraph 5.2.2 states: "*CO_2 emissions are a significant adverse impact from some types of energy infrastructure which cannot be totally avoided". "Any ES on air emissions will include an assessment of CO_2 emissions, but the policies set out in Section 2, including the EU ETS, apply to these emissions".*	An assessment of carbon emissions is included in **Chapter 17**: Climate Change and Sustainability (ES Volume I – **Application Document Ref. 6.2**). However, this Proposed Development also purposefully seeks to abate carbon dioxide emissions through the proposed carbon capture plant.
Paragraph 5.2.3 states: *"A particular effect of air emissions from some energy infrastructure may be eutrophication, which is the excessive enrichment of nutrients in the environment."*	Air quality impacts associated with nitrogen deposition on designated ecological receptors have been assessed in Section 8.6.
Paragraph 5.2.4 states: "*Design of exhaust stacks, particularly height, is the primary driver for the delivery of optimal dispersion of emissions and is often determined by statutory*	Stack height evaluation is assessed in Section 8.6 and **Appendix 8B:** Air Quality – Operational phase (ES Volume II - **Application Document Ref. 6.3**). Stack heights will however

Summary of NPS	Consideration within the Chapter
requirements. The optimal stack height is dependent upon the local terrain and meteorological conditions, in combination with the emission characteristics of the plant. The EA will require the exhaust stack height of a thermal combustion generating plant, including fossil fuel generating stations and waste or biomass plant, to be optimised in relation to impact on air quality. The IPC [Secretary of State] need not, therefore, be concerned with the exhaust stack height optimisation process in relation to air emissions (…)".	be finalised as part of the permitting process.
Paragraph 5.2.7 states: "*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;* • *any potential eutrophication impacts"*	The air quality impacts of all project stages have been assessed in this chapter including consideration of residual effects in Section 8.9.
NPS EN-2	
Paragraph 2.5.3 states: "Fossil fuel generating stations are likely to emit nitrogen oxides (NO_x) and sulphur oxides (SO_x), although SO_x emissions from gas-fired generating stations may be negligible… fossil fuel generating stations must apply a range of mitigation to minimise NO_x and other emissions."	NO_x emissions have been considered in the assessment of operational air impacts. Sulphur dioxide emissions are negligible from a gas fired power station. Consideration has also been given to baseline air quality conditions in the locality and the emission limit values that are achievable for the

Summary of NPS	Consideration within the Chapter
	proposed plant technology, based on legislative limits and use of BAT.
Paragraph 2.5.5 states: "The applicant should carry out an assessment as required in EN-1, consulting the Environment Agency and other statutory authorities at the initial stages of developing their proposals, as set out in EN-1 Section 4.2."	The air quality impacts of all project stages have been assessed in this chapter and presented in Section 8.6.
Paragraph 2.5.7 states: "Mitigation will depend on the type of generating station. However, Flue Gas Desulphurisation (FGD) and Selective Catalytic Reduction (SCR) will have additionally adverse impacts for noise and vibration, release of dust and handling of potentially hazardous materials, for example the ammonia used as a reagent."	SCR use is proposed for the Proposed Development to achieve the ELV set by legislation, to demonstrate BAT and to reduce the inlet concentration of NO_x into the CCP.

8.2.25 Table 8.5 provides a summary of relevant NPS advice regarding dust, odour, smoke and steam.

Table 8.5: Summary of relevant NPS advice regarding dust, odour, smoke and steam

Summary of NPS	Consideration within the Chapter
NPS EN-1	
Paragraph 5.6.4 states: *"The applicant should assess the potential for insect infestation and emissions of odour, dust, steam, smoke and artificial light to have a detrimental impact on amenity, as part of the Environmental Statement."*	The operation of the Proposed Development is not considered to have the potential to cause insect infestation, odour, dust, steam or smoke impacts, based on the choice of fuel and nature of plant operation. Management of artificial light will be controlled at the detailed design stage in accordance with the Indicative Lighting Strategy (**Application Document Ref. 5.11)** and the Framework Construction Environmental Management Plan

Summary of NPS	Consideration within the Chapter
	(CEMP) (**Application Document Ref 7.1**).
Paragraph 5.6.5 states: *"In particular, the assessment provided by the applicant should describe:* • The type, quantity and timing of emissions; • Aspects of the development which may give rise to emissions; • Premises or locations that may be affected by the emissions; • Effects of the emission on identified premises or locations; and • Measures to be employed in preventing or mitigating the emissions."	This chapter identifies sensitive receptors in the vicinity of the Site, describes the current baseline air quality conditions, outlines the assumptions regarding the nature, duration and scale of emissions and the predicted effect of emissions on identified sensitive receptors. The Rochdale Envelope and conservative assumptions have been applied in order to derive a worst-case scenario. Embedded mitigation measures are also included.
Paragraph 5.6.6 states: *"The applicant is advised to consult the relevant local planning authority and, where appropriate, the Environment Agency about the scope and methodology of the assessment."*	North Lincolnshire Council (NLC) as local planning authority and the Environment Agency have been consulted at scoping stage, informal consultation and at formal (statutory) consultation stages regarding the proposed approach to assessment of air impacts. Their views have been incorporated into the air impact assessment as discussed in Section 8.3.

8.2.26 The revised National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government (MHCLG) 2019a) does not set out policies for NSIP but its policies may have relevance to the development of such projects On conserving and enhancing the natural environment, Paragraph 170 of the NPPF states that:

(e) '*The planning system should contribute to and enhance the natural and local environment by: …preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…*'
Paragraph 170

8.2.27 Air quality in the UK has been managed through the Local Air Quality Management (LAQM) regime using NAQS objectives. The effect of a proposed development on the achievement of such policies and plans are matters that

may be a material consideration by planning authorities, when making decisions for individual planning applications. Paragraph 181 of the NPPF states 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.*"
Paragraph 181

8.2.28 The different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 183:

"*The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.*"
Paragraph 183

8.2.29 The Planning Practice Guidance (PPG) was updated on 1 November 2019 (MHCLG, 2019b), with specific reference to air quality. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely affect the implementation of air quality strategies and action plans and/ or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition, dust can also be a planning concern, for example, because of the effect on local amenity.

8.2.30 When deciding whether air quality is relevant to an application, the PPG states that a number of factors should be taken into consideration including if the development will:

- significantly affect traffic in the immediate vicinity of the Proposed Development Site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development

of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;

- introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled Combined Heat and Power (CHP) plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;
- expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality;
- give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations; and
- affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites.

8.2.31 Regarding how detailed an air quality assessment needs to be, the PPG states:

"*Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific*."

Local Development Plan Policy

8.2.32 Similarly, local planning policy may be something which the Secretary of State considers is both important and relevant to the determination of the Application for the Proposed Development.

8.2.33 The North Lincolnshire Local Plan (the 'Local Plan') was adopted in 2003 (North Lincolnshire Council (NLC) 2003), and a number of the policies have been replaced by the North Lincolnshire Local Development Framework Core Strategy ('the Core Strategy'), adopted in 2011 (NLC, 2011). A number of policies from the Local Plan were not directly replaced and have been saved. These include:

8.2.34 Policy DS1 – General Requirements states:

"*A high standard of design is expected in all developments in both built-up areas and the countryside and proposals for poorly designed development will be refused. All proposals will be considered against the criteria set out below:*

…

Amenity

iii) No unacceptable loss of amenity to neighbouring land uses should result in terms of noise, smell, fumes, dust or other nuisance, or through the effects of overlooking or overshadowing; and

…

v) no pollution of water, air or land should result which poses a danger or creates detrimental environmental conditions."

8.2.35 Policy DS11 – Polluting Activities states:

"*Planning permission for development, including extensions to existing premises and changes of use, will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including effluent, leachates, smoke, fumes, gases, dust, steam, smell or noise do not pose a danger by way of toxic release; result in land contamination; pose a threat to current and future surface or underground water resources; or create adverse environmental conditions likely to affect nearby developments and adjacent areas.*"

8.2.36 From the Core Strategy, Spatial Objective 7: Efficient Use and Management of Resources states:

"*To ensure the efficient use of resources, maximising recycling of minerals and waste products, minimising pollution, maintaining and improving air, soil and water quality, and employing sustainable building practices in new development*."

8.2.37 While there are no policies that are specifically targeted at air quality and pollution, pollution is considered in several other policies, namely:

- Spatial Objective 10: Creating A Quality Environment; and
- CS5: Delivering Quality Design in North Lincolnshire.

8.2.38 Pollution is also considered as part of the section covering transport and the environment.

Other guidance

8.2.39 Defra has published technical guidance LAQM TG (16) (Defra, 2016) to assist local authorities in fulfilling their duties in relation to Local Air Quality Management. Parts of this guidance, and associated tools, are also useful in assessing the impacts of individual developments within the planning process.

8.2.40 The Highways England (HE) publication the Design Manual for Roads and Bridges (DMRB) (HE, 2019) has been used to screen potential traffic air quality impacts to determine those impacts that may require more detailed assessment, and in the assessment of traffic air quality effects and the evaluation of significance.

8.2.41 The Institute of Air Quality Management (IAQM) in collaboration with Environmental Protection UK (EPUK) has published several guidance documents relating to the potential effects of dust generation during construction works and development control including:

- Guidance on the assessment of dust from demolition and construction v1.1, (IAQM, 2014 - updated 2016);
- Guidance on the assessment of mineral dust impacts for planning version 1.1 (IAQM 2016); and
- *Land-Use Planning & Development Control: Planning for Air Quality. v1.2.* (IAQM and EPUK, 2017).

8.3 Assessment Methodology

Consultation

8.3.1 The consultation undertaken with statutory consultees to inform this chapter, including a summary of comments raised *via* the formal Scoping Opinion (**Appendix 1B** in ES Volume II – **Application Document Ref. 6.3**) and in response to the formal consultation and other pre-application engagement, is summarised in Table 8.6.

Table 8.6: Consultation Responses

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
Secretary of State	June 2020 Scoping Opinion	Concern over the large distance between the automatic air quality monitoring stations used by North Lincolnshire Council and the Proposed Development site, and their ability to be representative of background concentrations in the vicinity of the Proposed Development. The ES should include a figure depicting all locations of air quality monitoring stations and agree the data with the relevant statutory consultees	Section 8.4 explains the available baseline monitoring data, and its applicability for the assessment. Further discussion of specific data for the construction and operational assessments is provided in **Appendix 8A:** Air Quality – Construction Phase and **Appendix 8B** (ES Volume II – **Application Document Ref. 6.3**). **Figure 8.5** (ES Volume III – **Application Document Ref. 6.4**) indicates the location of air quality monitoring locations.
		Justification of the suggested 2km study area for Human Health receptors should be provided, and a figure depicting this area should be provided.	The justifications for the selected study areas is provided in Section 8.3. The operational emissions study area is shown in **Figure 8.4** and road traffic emissions study area is shown on **Figure 8.3** (ES Volume III - **Application Document Ref. 6.4**).
		Requested that the number and height of stacks should be stated.	A description of the number and height of stacks is provided in

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
			Chapter 4: Proposed Development (ES Volume I - **Application Document Ref. 6.2**) and **Appendix 8B:** Air Quality – Operational Phase (ES Volume II - **Application Document Ref. 6.3**) provides information on the approach to stack heights assessment.
		The ES should clearly state which pollutants have been addressed in the assessment.	The pollutants assessed are detailed in Tables 8.1 – 8.3 of this chapter. Further discussion on the relevant pollutants is provided in **Appendix 8A:** Air Quality – Construction Phase and **Appendix 8B:** Air Quality – Operational Phase (ES Volume II - **Application Document Ref. 6.3**).
		The ES should describe the baseline air quality conditions with the area likely to experience impacts from the Proposed Development.	Available baseline monitoring data, and its applicability for the assessment is explained in Section 8.4.
		The methodology for the assessment should state how significant effects will be determined. Consider using IAQM Assessment of dust from demolition and construction	The determination of significance is described in Section 8.3 of this chapter, specifically within Table 8.8. The IAQM guidance referenced has been used in the assessment of

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		2014 when assessing the impacts from dust and particulate matter during construction/ decommissioning.	construction dust in **Appendix 8A:** Air Quality – Construction Phase (ES Volume II - **Application Document Ref. 6.3**).
		The air quality impacts on ecology (e.g. nitrogen deposition) should be assessed.	The air quality impacts on ecological receptors within 15km of the main emission sources within the Proposed Development have been assessed. The results at ecology receptors, including those for deposition, are provided in **Appendix 8B:** Air Quality – Operational Phase (ES Volume II - **Application Document Ref. 6.3**).
		The Inspectorate is content with an assessment of the effects of operational traffic being scoped out of the ES, provided traffic levels are below the relevant screening thresholds.	A detailed assessment of operational traffic emissions has not been undertaken, as the numbers of additional vehicles associated with the operational phase of the Proposed Development are below the DMRB and IAQM screening criteria for requiring such assessment.
		The Planning Inspectorate agrees to scoping out a quantitative assessment of decommissioning. The ES should	Decommissioning activities are presented in **Chapter 4**: The Proposed Development (ES Volume I - **Application Document Ref. 6.2**).

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		include as much detail as possible when describing decommissioning.	Effects from decommissioning on air quality are considered comparable to the effects resulting from construction, as detailed in **Appendix 8A:** Air Quality – Construction Phase (ES Volume I - **Application Document Ref. 6.3**).
Doncaster Council	June 2020 Scoping Opinion	Raised concern over the already high NO_2 levels in Thorne town and requested that this be considered in the assessment.	The assessment carried out in this chapter considers NO_2 impacts at the worst impacted location, which occurs in very close proximity to the operational Proposed Development Site. The impacts at this worst-case location have been demonstrated to be negligible adverse (see Table 8.13), therefore it is considered that impacts at Thorne town (over 8km upwind of the operational Proposed Development Site) would be considerably less and not significant.
Natural England	June 2020 Scoping Opinion	Assessment should take account of the risks of air pollution and how these can be managed or reduced.	Covered throughout this Chapter.

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
Keadby with Althorpe Parish Council	June 2020 Scoping Opinion	Expressed concern over amine emissions and the potential harm to local residents.	Emissions of amines have been assessed and compared against the proposed EAL for MEA and found to be negligible adverse at the most impacted location (see Table 8.13). It is therefore considered there is no risk of potential harm to the local population from emissions of amines.
Doncaster Council	Stage 2 (Statutory) Consultation January 2021	In response to the Applicant's response to the June 2020 comments on NO_2 levels (see cell above), Doncaster Council has provided further comment. They have agreed that an 8km distance from most sources would usually result in a negligible impact but in this instance, the source under consideration is a 910MWe power station and an area (i.e. Thorne Town) where NO_2 levels are already of concern with respect to exceedance of the extant UK air quality regulations.	The Applicant has considered air quality effects at Thorne Town within the assessment and the results are provided in **Appendix 8B:** Air Quality – Operational Phase (ES Volume II **– Application Document Ref. 6.3)**.
Natural England	Stage 2 (Statutory) Consultation January 2021	Natural England noted that they had not yet finalised a response and would provide advice on air quality impacts on both European sites and Sites of	Noted.

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		Special Scientific Interest (SSSI) (Risby Warren, Broughton Alder and Broughton Far Wood) as soon as possible, noting that there are a number of designated sites within 15km of the Proposed Development Site which require assessment for potential operational air quality impacts.	
Natural England	Stage 2 (Statutory) Consultation – late response February 2021	Natural England confirmed that the critical level for Risby Warren should remain at the lower level defined for the protection of bryophytes and lichens, but that the higher critical level can be applied to Broughton Alder and Broughton Far Wood. Natural England requested further information on the effects of the predicted air quality impacts on a number of sites.	The critical level applied to the relevant sites in the assessment has been applied accordingly. Further assessment and discussion on the associated effects has been provided in the Habitats Regulations Assessment Screening Report (**Application Document Ref. 5.12**)
North Lincolnshire Council (NLC)	Stage 2 (Statutory) Consultation January 2021	NLC note that in relation to human receptors, Vazon Bridge House (482507, 411501), located closest to the Proposed Development has not been identified.	Vazon Bridge House has been added as a receptor for the construction and operational assessments. A framework CEMP has been developed for the DCO application (**Application Document Ref. 7.1**)

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		NLC expect to see the following considered within a CEMP for the proposed development as a minimum: • Site dust monitoring, recording and complaint investigation procedures • Identification of receptors and the related risk of dust impact at all phases of the development, including when buildings and properties start to be occupied • Provision of water to the site • Dust mitigation techniques at all stages of development • Prevention of dust trackout • Communication with residents and other receptors • A commitment to cease the relevant operation if dust emissions are identified either by regular site monitoring or by the local authority • A no burning of waste policy	and covers all the aspects raised by NLC.
Public Health England (PHE)	Stage 2 (Statutory) Consultation January 2021	<u>Construction Impacts</u> It appears that gaps remain in the assessment of emissions from the	Construction of Keadby 2 Power Station is now largely complete and therefore there will not be any

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		Proposed Development and the cumulative impacts from nearby development/ works, including the Keadby 2 development site and Keadby 1 Power Station. It is noted that future plans for Keadby 1 have not yet been confirmed, with options comprising either continued operation (subject to a new contract) or decommissioning followed by removal.	cumulative construction effects with the Proposed Development given that the earliest date that construction of the Proposed Development could commence is Quarter 4, 2022. It is confirmed that Keadby 1 Power Station will not be able to operate at the same time as the Proposed Development so there will not be cumulative operational effects from the two power stations operating simultaneously. Similarly, any decommissioning of Keadby 1 Power Station would not occur concurrently with construction of the Proposed Development, as explained in Section 2.6 (**Chapter 2**: Assessment Methodology (ES Volume I – **Application Document Ref. 6.2**)). The approach to the assessment of cumulative impacts due to fugitive emissions of construction is provided in **Chapter 19**:Cumulative and

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
			Combined Effects (ES Volume I – **Application Document Ref. 6.2**) and further described in paragraphs 2.1.5 to 2.1.7 of **Appendix 8A:** Air Quality – Construction Phase (ES Volume II – **Application Document Ref. 6.3**). The assessment of construction road traffic emissions in this chapter accounts for projected growth in traffic flows from an existing baseline, and therefore is inherently cumulative. The rationale for this is explained in **Appendix 10A**: Transport Assessment (ES Volume II – **Application Document Ref. 6.3**).
		Overall, there is a lack of clarity regarding works across different phases, whether activities occur simultaneously, their intensity, what comprises existing infrastructure and what will be commissioned/constructed. Further consideration of cumulative and combined impacts for the baseline assessments is required. Limited details are available for the monitoring to be	Assumptions in relation to working activities during construction are set out in **Appendix 8A:** Air Quality – Construction Phase (ES Volume II – **Application Document Ref. 6.3**). The mitigation and monitoring measures proposed to control emissions beyond the site boundary will be detailed and secured through the final CEMP. A Framework CEMP

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		undertaken to assess these and the effectiveness of mitigation measures.	is provided as **Application Document Ref. 7.1**.
		Greater clarity is needed on consideration of baseline and cumulative impacts from the whole site footprint. It is recommended this include Keady 2 construction and Keadby 1 removal (unless continued operation confirmed), details and justifications regarding which assessment year has been chosen and any monitoring proposals.	Construction of Keadby 2 Power Station is now largely complete and therefore there will not be any cumulative effects with the Proposed Development given that the earliest date that construction could commence is Quarter 4, 2022. Similarly, any decommissioning of Keadby 1 Power Station would not occur concurrently with construction of the Proposed Development, as explained in Section 2.6 (**Chapter 2**: Assessment Methodology (ES Volume I – **Application Document Ref. 6.2**)). The approach to the assessment of cumulative impacts due to fugitive emissions of construction is detailed in paragraphs 2.1.5 to 2.1.7, **Appendix 8A:** Air Quality – Construction Phase (ES Volume II - **Application Document Ref. 6.3**).

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		Assessment of NRMM impacts within wider parts of the development should include cumulative impacts from other air pollution sources and include both PM_{10} and $PM_{2.5}$.	Emissions from NRMM and site plant have been considered, and this is detailed in Section 8.6 of this chapter.
		Clarification regarding the absence of any receptors identified north of the abnormal indivisible load route is required.	The Abnormal Indivisible Load (AIL) route is the same route as is used for the current Keadby 2 Power Station construction project. The movement of AIL along this existing AIL route is not considered to lead to significant air quality effects, and these have been screened out, in line with guidance published by HE and the IAQM see Table 10 of **Appendix 8A:** Air Quality – Construction Phase (ES Volume II - **Application Document Ref. 6.3**).
		Better consistency required across documentation in the impact and risk assessment employed. For example, 3.2.13 of Appendix 8A describes a low risk of unmitigated dust impacts on human health; whilst Chapter 8 describes a low to medium risk.	This has been corrected in the **Chapter 8:** Air Quality (ES Volume I – **Application Document Ref. 6.2**) text to be consistent with **Appendix 8A:** Air Quality – Construction Phase (ES Volume II - **Application Document Ref. 6.3**).

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		With reference to Table 16 of Appendix 8A, it is unclear how values for the 'do something' scenario have been derived and what measures these would comprise.	The methodology to determine predicted air quality effects from construction traffic is detailed in Section 3.3, **Appendix 8A:** Air Quality – Construction Phase (ES Volume II - **Application Document Ref. 6.3**).
		Limited assessment of findings against Air Quality Standards has been made, including the impact of the projected maximum HGV movements for the first two months of the construction phase on sensitive receptors.	The assessment against relevant Air Quality Standards is presented in Section 8.6 of this chapter.
		<u>Operational Impacts</u> It is currently unknown which amine products will be emitted, particularly those likely to be degraded to N-amines, and how much use of the plant will affect the amount which is emitted – the overall emission could be up to 50% of the EAL. Once more is known, it would be beneficial to potentially re-model in order to get a more realistic impression of what the process contribution to the overall EAL is likely to be, and it is noted	A screening assessment was carried out at PEI stage, and this has been refined for the ES, using commercially available modelling software for the assessment of amines. This assessment is presented in **Appendix 8C:** Air Quality Assessment of Amine Degradation Products (ES Volume II - **Application Document Ref. 6.3**).

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		that further work is planned with respect to this. Uncertainties regarding the carbon capture process and equipment makes it difficult to assess the potential public human health impacts. We would welcome the inclusion of further details regarding the proposed technologies.	Until a final licensor is selected, the assessment of N-amines can only be indicative, as the propriety amine solvent and its degradation products will be licensor specific. However, numerous conservative assumptions have been applied to the assessment of N-amines. It is intended that once the final licensor has been chosen, the N-amine assessment will be revisited with specific data, and this will be a requirement by the Environment Agency for the Environmental Permit.
		Greater clarity and consistency in the terminology and description of potential process emissions is recommended. For example, it is assumed that in Chapter 8, Section 8.6.11, when considering the impact of emissions from the CCU plant, that this also includes emissions from the CCGT plant as suggested in Appendix 8B.	The exhaust gas from the CCGT plant enters the CCP for the carbon dioxide to be removed, therefore the only emissions when operating in abated mode are from the CCP absorber stack and includes both the combustion emissions from the CCGT (minus the captured carbon dioxide) and any additional emissions from the CCP. This is described fully in **Chapter 4:** The Proposed

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
			Development (ES Volume I - **Application Document Ref. 6.2)**.
		Use of the lowest stack height as described in Section 8.2.42 (Chapter 8), would potentially be detrimental to air quality, it would be helpful to clarify whether this informs a worst-case scenario.	The stack heights for the plant have been optimised with consideration given to minimisation of ground-level air quality impacts balanced against the visual impacts of taller stacks. Dispersion modelling has been undertaken to determine the optimum stack height range, through comparison of the maximum impacts at human health and ecological receptors. Further information on the determination of the stack heights is provided in **Appendix 8B**: Air Quality – Operational Phase, (ES Volume II - **Application Document Ref. 6.3**). The lowest potential stack height has been determined which is considered to adequately disperse emissions from the Proposed Development assessed options. This represents the worst-case scenario for air quality impacts.

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
			A higher stack could be employed - up to the 105m high stack that has been assessed in **Chapter 14**: Landscape and Visual Amenity (ES Volume I - **Application Document Ref. 6.2**) which would further reduce predicted ground level pollutant concentrations. The final stack height used will result in impacts that are no worse than those presented in this assessment.
		Isopleth plots have been provided for NO_2 only and it is unclear why North Moor Farm has not been identified. Clearer and more accurate identification, reference and justification for selection of the human health receptors in the assessments is recommended. Although human health receptors have been selected to be representative of residential dwellings in the area, consideration is needed for inclusion of Red House and adjacent properties which are in close proximity to the main site (noted to be adjacent to	The results for air quality assessment were reported at the point of maximum impact, irrespective of individual receptor locations, and concluded that NO_2 impacts were negligible adverse. Consequently, impacts at North Moor Farm, Roe Farm, and the Sea Cadet Station would be negligible adverse. It is understood that the Red House has been demolished, as detailed in **Chapter 3:** The Site and it's Surroundings (ES Volume I - **Application Document Ref. 6.2**).

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		emergency vehicle access road), Roe Farm, and Scunthorpe Sea Cadets (youth group), which have not been acknowledged.	
		Baseline Assessments should include an assessment of cumulative impacts including the use of generators and Keady 1 Power Station (unless decommissioning and removal confirmed with no overlap in their operation).	As explained in **Chapter 2**: Assessment Methodology (ES Volume I – **Application Document Ref. 6.2**) emissions from Keadby 1 Power Station would not occur concurrently with those of the operational Proposed Development. This is because the capacity of the existing natural gas pipeline precludes a scenario in which the Proposed Development and Keadby 1 Power Station could operate concurrently.
		It is recommended that the following specific points and recommendations are considered: • Emissions of polyaromatic hydrocarbons (PAH) were acknowledged as a potential issue in the scoping report. In light of air quality standard exceedances in the	There are no PAH emissions associated with the emissions from the Proposed Development, including the CCP. The CCGT plant is gas fired, and the particulate emission from such plant is minimal. This is reflected in the fact

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		Scunthorpe area linked to local industrial sources; confirmation that potential PAH emissions have been adequately scoped out is required. • Emissions of particulate matter from all potential sources do not appear to have been assessed, clarification is needed in light of the potential for unabated emissions from the CCGT plant (Section 3.4.2; Appendix 8b). • Across the air quality assessments, for the operational and construction phase, different assessment years have been chosen for peak activity (2025 and 2031 respectively). In view of the proximity of residential properties to the water connection, discharge corridors, abnormal indivisible load route and permanent emergency access via Chapel Road; it is recommended that further details are included in each of the chapters regarding the nature of these and any potential impacts from the construction,	that there are no BAT-AEL for particulate emissions from CCGT plant. The approach to assessment including choice of assessment scenarios and years is explained in **Chapter 2**: Assessment Methodology (ES Volume I – **Application Document Ref. 6.2**). The assessment years have been chosen by specialists as the worst-case for each topic. Considering that the DCO may be granted allowing construction to commence within up to 7 years from the date of consent, construction activities may commence as late as 2029. For this reason, 2031 is assessed as the peak of construction in **Chapter 10**: Traffic and Transport (ES Volume I – **Application Document Ref. 6.2**) as it provides the worst-case in regard to road traffic. The Air quality assessment has been updated to use the 2031 traffic data (which includes a

Consultee or organisation approached	Date and nature of consultation	Summary of response	How comments have been addressed in this chapter
		operational and decommissioning phases.	maximum growth on the road network) with 2025 emissions and background data, both to align with the operational phase, but also to provide a conservative assessment of potential air quality effects due to construction traffic emissions.
Canal & River Trust	Stage 2 (Statutory) Consultation January 2021	There is potential that dust generated from the construction compound and turnaround areas could reach the canal unless appropriate precautions are undertaken.	Details of the mitigation proposed to avoid significant effects beyond the Proposed Development Site boundary are set out in the framework CEMP (**Application Document Ref. 7.1**). The final CEMP will be secured through a requirement of the DCO.
Environment Agency	March 2021 (Pre-Application Environmental Permit)	The proposed approach to permitting including assessment of emissions to air was discussed. It was noted that the Environment Agency agreed with the proposed approach presented in this chapter and accompanying appendices.	N/A

8.3.2 In addition to the formal comments received in Table 8.6, engagement has been undertaken with the Environment Agency over the development of BAT for carbon capture operations. The Environment Agency's Air Quality Modelling and Assessment Unit (AQMAU) has also been consulted over the application of the ADMS amines chemistry module. The Environment Agency has provided a guidance note on the approach to assessment of amine and N-amine emissions (Environment Agency, 2020) and this has been applied in the assessment.

Summary of Key Changes to **Chapter 8:** Air Quality since Publication of the Preliminary Environmental Information (PEI) Report and PEI Report Addendum

8.3.3 The PEI Report was published for statutory consultation in November 2020, allowing consultees the opportunity to provide informed comment on the Proposed Development, the assessment process and preliminary findings through a consultation process, prior to the finalisation of this ES. A PEI Report Addendum was subsequently published in March 2021 following a change in Applicant name and minor changes that were made to the indicative Order Limits since the formal Stage 2 consultation.

8.3.4 The key changes relevant to this chapter since the PEI Report and PEI Report Addendum were published are summarised in Table 8.7 below.

Table 8.7: Summary of key changes to chapter since publication of the PEI Report and accompanying addendum:

Summary of change since PEI Report and addendum	Reason for change	Summary of change to chapter text in the ES
Additional receptors have been added at the request of a number of consultees.	To ensure consultees comments are addressed.	Additional receptors added to Table 8.9 of this Chapter.
An additional appendix outlining the assessment methodology and results of amine degradation products has been produced to accompany this chapter and is referenced herein.	It was considered that an accompanying technical appendix would assist in explaining the complex methodology involved in the assessment and aid readers in the interpretation of the results presented in this chapter.	**Appendix 8C:** Assessment of Amines and their Degradation Products (ES Volume II – **Application Document Ref. 6.3**) accompanies the Chapter.
Higher critical levels for the assessment of ammonia impacts and effects have	Through consultation with Natural England, it has been identified that	**Appendix 8B:** Air Quality – Operational Phase

Summary of change since PEI Report and addendum	Reason for change	Summary of change to chapter text in the ES
been applied to Broughton Far Wood and Broughton Alder receptors.	these sites are not as sensitive to atmospheric ammonia concentrations as was conservatively assessed at PEI Report stage.	Table 15 (ES Volume II – **Application Document Ref. 6.3**) has been updated to reflect this change.

Overview

8.3.5 Details of the assessment methodologies are provided within **Appendix 8A**: Air Quality - Construction Phase, **Appendix 8B**: Air Quality - Operational Phase and **Appendix 8C**: Assessment of Amine Degradation Products (ES Volume II – **Application Document Ref. 6.3**). These technical assessments provide detailed descriptions of the sensitive human receptors, the ecological receptors and the methodology for assessing the impacts of construction dust, construction traffic and the operational stack emissions of the Proposed Development.

Study Area

8.3.6 The study areas for the assessments carried out have been defined according to the appropriate guidance for the type of assessment being carried out (i.e. construction dust and NRMM, construction traffic and the operational Proposed Development), and therefore vary for the various assessments.

8.3.7 The study area for the construction dust NRMM emissions has been applied in line with IAQM guidance (IAQM, 2014), extending:

- up to 350m beyond the Proposed Development Site boundary and 50m from the construction traffic route (up to 500m from the Proposed Development Site entrance), for human health receptors; and
- up to 50m from the Proposed Development Site boundary and construction traffic route (up to 500m from the Proposed Development Site entrance) for ecological receptors.

8.3.8 The study area for the traffic assessment is defined in the screening criterion set out in the DMRB and the IAQM/ EPUK guidance, which states that only properties and habitat sites within 200m of affected roads (roads that experience a change in traffic flow above a certain criteria) should be considered in road traffic emissions assessments.

8.3.9 The study area for the operational Proposed Development point source emissions extends up to 15km from the 'Main Site' (defined in **Chapter 3**: The Site and Surrounding Area (ES Volume I – **Application Document Ref. 6.2**) in

the northern part of the Proposed Power and Carbon Capture (PCC) Site where the CCGT and CCP would be located, in order to assess the potential impacts on sensitive ecological receptors, in line with the Environment Agency risk assessment methodology (Defra and Environment Agency, 2016):

- SPA, SAC, Ramsar sites and SSSI within 15km; and
- Local Nature Sites (including ancient woodlands, Local Wildlife Sites (LWS) and National and Local Nature Reserves (NNR and LNR)) within 2km.

8.3.10 In terms of human health receptors, the predicted impacts from the operational Proposed Development become negligible well within 2km and therefore sensitive receptors for the human health impacts only are concentrated within a 2km study area.

Impact Assessment Methodology

8.3.11 The potential emissions to air from construction and operation of the Proposed Development have been determined or estimated, and key local receptors have been identified, together with the current local ambient air quality.

8.3.12 The potential pollutant concentrations resulting from the projected emissions arising from the construction and operational phases of the Proposed Development have been predicted using atmospheric dispersion modelling techniques where appropriate, which enabled the assessment of the impacts associated with the Proposed Development on the existing local ambient air quality and in particular on the identified sensitive receptors. The assessment methodology for each type of emission is outlined below, with further detail being provided in the accompanying technical appendices (**Appendix 8A**: Air Quality - Construction Phase, **Appendix 8B**: Air Quality - Operational Phase and **Appendix 8C**: Assessment of Amine Degradation Products, ES Volume II – **Application Document Ref. 6.3**).

8.3.13 The process and traffic emissions assessments are made with reference to the relevant AQAL defined in Table 8.1 to Table 8.3 in Section 8.2 of this Chapter.

Construction phase – construction dust assessment

8.3.14 The movement and handling of soils and spoil during construction activities for the Proposed Development is anticipated to lead to the generation of some short-term airborne dust. The occurrence and significance of dust generated by earth moving operations is difficult to estimate and depends heavily upon the meteorological and ground conditions at the actual time and location of the work, and the nature of the activity being carried out.

8.3.15 At present, there are no statutory UK or EU standards relating to the assessment or control of dust. The emphasis of the regulation and control of construction dust, therefore, is through the adoption of Best Practicable Means (BPM) when working on site to mitigate any potential impacts. It is intended that significant adverse environmental effects are avoided at the design stage and

through embedded mitigation where possible, including the use of good working practices to minimise dust formation which is detailed further in Mitigation and Enhancement Measures of this Chapter.

8.3.16 The IAQM provides guidance for good practice and for qualitative assessment of risk of dust emissions from construction and demolition activities (IAQM, 2014). The guidance considers the risk of dust emissions from unmitigated activities to cause human health impacts (associated with PM_{10}), dust soiling impacts, and ecological impacts (such as physical smothering, and chemical impacts for example from deposition of alkaline materials). The appraisal of risk is based on the scale and nature of activities and on the sensitivity of receptors, and the outcome of the appraisal is used to determine the level of good practice mitigation required for adequate control of dust.

8.3.17 The assessment undertaken for the Proposed Development is consistent with the overarching approach to the assessment of the impacts of construction, and the application of example descriptors of impact and risk set out in IAQM guidance. It considers the significance of potential impacts with no mitigation and recommends mitigation measures appropriate to the identified risks to receptors. The steps in the assessment are to:

- identify receptors within the appropriate study area for the Proposed Development Site;
- identify the magnitude of impact through consideration of the scale, duration and location of activities being carried out (including demolition, earthworks, construction and trackout, where construction vehicles could carry mud onto the public highway);
- establish the sensitivity of the area through determination of the sensitivity of receptors and their distance from construction activities;
- determine the risk of significant impacts on receptors occurring as a result of the magnitude of impact and the sensitivity of the area, assuming no additional mitigation (beyond the identified development design and impact avoidance measures) is applied;
- determine the level of additional mitigation required based on the level of risk, to reduce potential impacts at receptors to insignificant or negligible; and
- summarise the potential residual effects of the mitigated works.

8.3.18 The criteria for assessment of magnitude, sensitivity, and risk for construction dust are summarised in Tables 1 – 6 **Appendix 8A**: Air Quality – Construction Phase (ES Volume II **– Application Document Ref. 6.3**).

Construction phase - construction site plant (Non-Road Mobile Machinery (NRMM) Assessment

8.3.19 As described in **Chapter 5**: Construction Programme and Management (ES Volume I - **Application Document Ref. 6.2**), subject to being granted development consent and following a final investment decision, it is anticipated that the early construction works at the A18/ Mabey Bridge Replacement could commence in Q4 2022 and following a 6 month period, the main construction phase could last approximately three years, followed by a period of commissioning (i.e. to 2026).

8.3.20 There are likely to be emissions to air during construction activities arising from on-site construction plant or NRMM. The IAQM guidance (IAQM, 2014) states:

"*Experience of assessing the exhaust emissions from on-site plant … and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/ vehicles and their operating hours and locations to assess whether a significant effect is likely to occur*." The screening criterion in the DMRB (HE, 2019) and IAQM/ EPUK (IAQM, 2017) states that only properties and habitat sites within 200m of roads should be considered in traffic assessments. This has been considered in determining the potential for impacts from NRMM associated with the Proposed Development on sensitive receptors. A qualitative assessment of the potential for impact from NO_2 and PM_{10} emissions from NRMM on identified receptors has therefore been made based on the criteria outlined in the DMRB guidance.

Construction and operational phase - road traffic assessment

8.3.21 The incomplete combustion of fuel in vehicle engines results in the presence of combustion products of CO, PM_{10}, and $PM_{2.5}$ in exhaust emissions as well as hydrocarbons (HC) such as benzene and 1,3-butadiene. Similarly, but to a lesser extent, any sulphur in the fuel can be converted to SO_2 that is then released to atmosphere. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form oxides of nitrogen, mainly in the form of nitric oxide (NO), which is then converted to NO_2 in the atmosphere. NO_2 is associated with adverse effects on human health. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle across the UK vehicle fleet in the long term.

8.3.22 Although SO_2, CO, benzene, and 1,3-butadiene are present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the context of this Proposed Development. This is because the released concentrations of these pollutants are low enough so as to not be likely to give rise to significant effects. In addition, no areas within the administrative boundaries of North Lincolnshire Council are considered to be at risk of exceeding the relevant objectives for these pollutants, therefore the risks to the attainment of the relevant air quality objectives in the vicinity of the Proposed Development are considered

negligible. Emissions of SO_2, CO, benzene, and 1, 3-butadiene from road traffic are therefore not considered further within this assessment.

8.3.23 The exhaust emissions from road vehicles that do have the potential to affect the ambient concentrations of pollutants are NO_2, PM_{10} and $PM_{2.5}$. Therefore, the assessment of the significance of road traffic air quality impacts only considers these pollutants.

8.3.24 DMRB LA105 guidance (HE, 2019) sets out criteria to establish the need for an air quality assessment from road traffic. The guidance considers the following changes in traffic anticipated as a result of a development, to identify the need for further evaluation:

- Annual Average Daily Traffic (AADT) flows of more than 1,000 vehicles;
- 200 Heavy Duty Vehicles (HDV, all vehicles greater than 3.5 tonnes gross weight, including buses);
- a change in the speed band; or
- a change in carriageway alignment by >5m.

8.3.25 Guidance published by the IAQM/ EPUK (IAQM, 2017) proposes a lower threshold in AADT flow to warrant a detailed air quality assessment of a change of 500 Light Duty Vehicles (LDV, all vehicles less than 3.5 tonnes gross weight) or 100 HDV when outside of an AQMA. For changes in traffic below these criteria, significant changes in air quality are not expected.

8.3.26 As described in **Chapter 5**: Construction Programme and Management (ES Volume I – **Application Document Ref. 6.2**), junction improvements at the A18 junction with the access road are proposed by the Applicant. Work 8A is included in the draft DCO (**Application Document Ref. 2.1**) and shown on the Work Plans (**Application Document Ref. 4.3**) and includes carriageway widening along the north of the existing A18 carriageway alignment. Associated land is therefore included in the Order Limits (refer to **Figure 3.2** in ES Volume III– **Application Document Ref. 6.4**). The carriageway widening would not exceed the >5m screening threshold above.

8.3.27 In addition to the minor modifications to the existing A18 road carriageway, it is anticipated that a temporary reduction in the speed limit at the Proposed Development Site junction from 60mph to 40mph, consistent with the temporary restriction in place for the Keadby 2 Power Station construction project, is likely to be sought for the construction of the Proposed Development.

8.3.28 The proposed modifications to the junction and continuation of temporary speed limits currently in place for Keadby 2 construction have been assessed taking into account the design proposals.

8.3.29 Guidance published by the IAQM proposes a lower threshold in AADT flow to warrant a detailed air quality assessment. In order to conduct a more conservative assessment of the air quality impacts of construction traffic, the

lower IAQM screening criteria has been applied to this assessment. The AADT associated with the associated with the construction phase of the Proposed Development therefore requires detailed air quality modelling.

8.3.30 This assessment has used the latest version of dispersion model software 'ADMS-Roads' (v5.0.0.1) to quantify baseline pollution levels at selected receptors due to road traffic emissions. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies.

8.3.31 The details of the current assessment of traffic are presented in **Chapter 10**: Traffic and Transportation (ES Volume I – **Application Document Ref. 6.2**). The traffic data used in this assessment includes the following scenarios:

- 2020 Baseline Scenario (for model verification process) (2020 Base);
- 2031 Future Baseline Scenario (for Long Term Trends Calculations) (2031 Future Base);
- 2031 Future Construction Year Base + Committed Development Scenario (2031 Base); and
- 2031 Future Construction Year Base + Committed + Peak Construction Scenario (2031 Construction Peak).

8.3.32 The traffic data for the future year scenarios has been based on projected growth in traffic flows up to 2031, to provide a 'worst-case' assessment of traffic flows. In regard to air quality, there has been a decrease in background concentrations of pollutants such as NO_2 due to improvements in vehicle, industrial, commercial and residential emissions. This trend is expected to continue, and concentrations and emissions in 2031 are anticipated to be lower than current levels. In order to provide a conservative assessment, 2031 traffic data has been used with 2025 emission factors and background concentrations, to align with the anticipated opening year. The traffic scenarios modelled as part of the air quality assessment are:

- 2020 Baseline Scenario (for model verification process), using 2020 traffic data, 2020 emissions factors, 2020 background concentrations and 2019 meteorological data;
- 2025 Future Baseline Scenario (for Long Term Trends Calculations), using 2031 traffic data, 2025 emissions factors, 2025 background concentrations and 2019 meteorological data;
- 2025 Future Construction Year Base + Committed Development Scenario, using 2031 traffic data, 2025 emissions factors, 2025 background concentrations and 2019 meteorological data; and
- 2025 Future Construction Year Base + Committed + Peak Construction Scenario, using 2031 traffic data, 2025 emissions factors, 2025 background concentrations and 2019 meteorological data.

8.3.33 The future decommissioning baseline scenario is not included, as it is considered that the effects would be comparable to, or lower than, construction impacts, particularly given the expected improvements in vehicle fleet emissions over that time.

8.3.34 Data in the form of traffic flows, composition (percentage HGV), and speed is used in modelling of emissions from road traffic during the construction phase.

8.3.35 Consideration has also been given within the assessment to the potential cumulative traffic emissions from the construction of the Proposed Development as well as the contribution from traffic associated with other committed schemes in the area. This is discussed further in **Chapter 10**: Traffic and Transportation (ES Volume I - **Application Document Ref. 6.2**).

Operational phase – operational traffic assessment

8.3.36 No detailed assessment of operational traffic emissions has been made, as the numbers of additional vehicles associated with the operational phase of the Proposed Development are below the DMRB and IAQM screening criteria for requiring such assessment.

Operational phase – process emissions from the operational plant

8.3.37 Emissions from the Proposed Development, assumed to be operational at the earliest in 2026[1], has been assessed using the Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2017), in order to identify where proposed emissions can be screened out as being unlikely to cause significant effects. Detailed dispersion modelling using the atmospheric dispersion model ADMS (currently ADMS 5.2.2) has been used to calculate the concentrations of pollutants at identified receptors. These concentrations have been compared with the defined AQAL for each pollutant species, as summarised in Table 8.1 to Table 8.3.

8.3.38 Dispersion modelling calculates the predicted concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model employed has been developed for UK regulatory use. **Appendix 8B**: Air Quality – Operational Phase (ES Volume II - **Application Document Ref. 6.3**) details the model inputs for the assessment, with further details on the amine assessment presented in **Appendix 8C**: Air Quality Assessment of Amine Degradation Products (ES Volume II - **Application Document Ref. 6.3**).

8.3.39 The assessment has been based on a single CCGT unit and its associated CCP being operated continuously, as this is considered to represent the worst-case scenario in terms of the annual average operational emissions, as detailed

[1] As described in **Chapter 2**: Assessment Methodology (ES Volume I – **Application Document Ref. 6.2**) timescales for commercial operation are linked to the development of the Humber Low Carbon Pipeline by National Grid Carbon into which the Proposed Development will connect.

in **Appendix 8B**: Air Quality - Operational Phase (ES Volume II **- Application Document Ref. 6.3**).

8.3.40 Whilst it is recognised that during start-up and shut down there may be short periods where emission concentrations are higher than those assessed, at this stage in the design process, there is limited data on the duration and release concentration of these emissions. During such times, it is envisaged that although the emission concentration may be higher, the gas flow rate will be lower, therefore resulting in mass emissions are likely to be reasonably comparable with steady state operation. It is therefore considered that this will have a minimal impact on the short-term impacts from the Proposed Development. It is anticipated that detail on start-up emissions will become available during the FEED process and therefore these assumptions will be reappraised when information becomes available, as part of the Environmental Permit process.

8.3.41 The first year of operation (referred to as opening) of the Proposed Development is assumed to be 2026 for the purpose of this assessment, which is the earliest date that the Proposed Development could realistically start to operate.

8.3.42 The assessment of worst-case long-term (annual mean) and short-term (daily and hourly mean) emissions resulting from the operation of the Proposed Development has been undertaken by comparing the maximum process contributions ('PC') that occur anywhere, (in order to ensure a worst-case assessment in terms of human health impacts) with the annual mean and hourly mean AQAL, taking into consideration the baseline air quality, in accordance with Environment Agency's Risk Assessment methodology (Defra and Environment Agency, 2017).

8.3.43 An assessment of nutrient nitrogen enrichment has been undertaken by applying published deposition velocities to the predicted annual average NO_2 and NH_3 concentrations at the identified ecological sites, determined through dispersion modelling, to calculate nitrogen deposition rates (expressed as kilograms per hectare per year, Kg/ha/yr). These deposition rates have then been compared to the Critical Loads for nitrogen published by UK APIS (CEH and APIS, 2016), taking into consideration the baseline air quality.

8.3.44 Potential increases in acidity on designated ecological receptors from depositional contributions of NO_2 and NH_3 from the process contribution have also been considered. Acid deposition is derived from nitrogen deposition modelling values using standard conversion factors and expressed as kilograms of nitrogen equivalent per hectare per year (KqN_{eq}/ha/yr). The PC acid deposition rates and baseline deposition rates have been used within the APIS Critical Load Function Tool (CEH and APIS, 2016) to determine whether the contribution will result in exceedance of the defined acidity Critical Loads for the most sensitive feature.

8.3.45 Several non-statutory habitat sites have also been assessed for both nutrient nitrogen and acid deposition, due to the proximity of these sites to the Proposed Development. These include LWS and LNR. For these sites, there is little data available with regards to habitat types present and therefore the relevant Critical Loads Classes to be applied, and therefore PC have been considered against an assumed appropriate Critical Load determined for the appropriate habitat type, as informed by **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**).

8.3.46 An assessment of combined effects with the Keadby 2 Power Station emissions is considered by including Keadby 2 Powe Station contributions as part of the modified baseline. Cumulative impacts with other committed developments that could interact with the operational impacts and effects of the Proposed Development has been carried out and is presented in **Appendix 8B**: Air Quality – Operational Assessment (ES Volume II - **Application Document Ref. 6.3**) and summarised in **Chapter 19**: Cumulative and Combined Effects (ES Volume I - **Application Document Ref. 6.3**). The impact of cumulative operational emissions on nutrient nitrogen deposition on habitats is considered in the Habitat Regulations Assessment Screening Report (**Application Document Ref. 5.12**).

Evaluation of significance – construction phase dust assessment

8.3.47 For potential amenity effects, such as those related to dust deposition, the aim is to bring forward a scheme, to include mitigation measures as necessary that minimise the potential for amenity, human health, and ecological impacts as a result of the Proposed Development construction works.

8.3.48 The IAQM guidance (IAQM, 2014) does not provide a method for the evaluation of impacts on receptors from construction dust, rather a means to determine the level of mitigation required to avoid significant impacts on receptors. The guidance indicates that application of appropriate mitigation should ensure that residual effects will normally be 'not significant'. Such control measures are proposed to be included in the final CEMP – a framework for which is included as **Application Document Ref. 7.1**.

Evaluation of significance – traffic and operational emissions assessment

8.3.49 The evaluation of the significance of air quality effects from the traffic and operational point sources has been based on the criteria referenced in IAQM/ EPUK guidance (IAQM, 2017), and in the Environment Agency's EPR Risk Assessment guidance (Defra and Environment Agency, 2017). The predicted changes in pollutant concentrations are compared to AQAL to determine the magnitude of change.

8.3.50 For a change of a given magnitude, the IAQM publication 'Land-Use Planning & Development Control: Planning for Air Quality (IAQM, 2017) has published recommendations for describing the magnitude of long-term impacts at individual receptors and describing the significance (Table 8.8) of such impacts.

This terminology has been changed where appropriate in order to maintain consistency with the rest of this ES – where the IAQM uses 'substantial' this has been changed to 'major', and 'slight' has been changed to 'minor'.

Table 8.8: Air quality impact descriptors for long term changes in ambient pollutant concentrations

Long term averaging concentration at receptor	Percentage change in annual mean concentrations				
	Up To 0.5% Imperceptible	0.5 – 1% Very Low	2-5% Low	6-10% Medium	>10% High
75% or less of AQAL	Negligible	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Negligible	Minor	Moderate	Moderate	Major
103-109% of AQAL	Negligible	Moderate	Moderate	Major	Major
110% or more of AQAL	Negligible	Moderate	Major	Major	Major

AQAL = Air Quality Assessment Level (NAQS objective or Environmental Assessment Level)

8.3.51 The IAQM guidance (IAQM, 2017) is not explicit in the identification of whether any of the above impact descriptors should be considered 'significant' or 'not significant' effects, rather it indicates that the descriptors should be applied to individual receptors and a 'moderate' adverse impact at one receptor may not mean that the overall impact has a significant effect; other factors need to be considered. However, it indicates further that 'negligible' impacts are likely to lead to effects that are 'not significant' and 'major' impacts describe the potential for 'significant' effects. The judgment of significance of effects adopted within this assessment is discussed below.

8.3.52 The Environment Agency's EPR risk assessment screening criteria for comparison of PC with AQAL states that an emission may be considered insignificant (or negligible) where:

- Short term PC <=10% of the AQAL; and
- Long term PC <=1% of the AQAL.

8.3.53 Where an emission cannot be screened out as insignificant, the second stage of screening considers the PC in the context of the existing background

pollutant concentrations; the predicted environmental concentration (PEC) is considered acceptable where:

- Short term PC <20% of the short-term AQAL minus twice the long-term background concentration; and
- Long term PEC (PC + background concentration) <70% of the AQAL.

8.3.54 For local nature sites, such as LWS, the Environment Agency's guidance states that where the short or long-term PC is less than 100% of the respective standard, then there are unlikely to be significant effects due to changes in air quality. There is no need to assess the PEC.

8.3.55 Where the PEC is not predicted to exceed the AQAL and the proposed emissions comply with the BAT-AEL (or equivalent requirements) the emissions are typically considered acceptable by the Environment Agency.

8.3.56 The IAQM guidance indicates that the Environment Agency's threshold criterion of 10% of the short term AQAL is sufficiently small in magnitude to be regarded as having an 'insignificant' effect. The IAQM guidance deviates from the Agency's guidance (discussed below) with respect to the background contribution; the IAQM guidance indicates that severity of peak short-term concentrations can be described without the need to reference background concentrations as the PC is used to measure impact, not the overall concentration at a receptor. The peak short-term PC from an elevated source is described as follows:

- PC <=10% of the AQAL represents an 'insignificant' (negligible) impact;
- PC 11-20% of the AQAL is small in magnitude representing a minor impact;
- PC 21-50% of the AQAL is medium in magnitude representing a moderate impact; and
- PC >51% of the AQAL is large in magnitude representing a 'substantial' (major) impact.

8.3.57 The impact of point source emissions on ecological receptors, through deposition of nutrient nitrogen or acidity, has been evaluated using the Environment Agency and Natural England insignificance criterion of 1% of the long-term objective, as above.

8.3.58 Where emissions are not screened as insignificant (negligible), the descriptive terms for the air quality effect outlined in Table 8.6 above have been applied.

Evaluation of significance – proposed development as a whole

8.3.59 Following the assessment of each individual air quality effect (construction dust, traffic and operational plant), the significance of all of the reported effects is then considered for the Proposed Development in overall terms, recognising that construction dust and traffic will occur in the same time period, but that

operational effects would occur at a later date. The potential for the Proposed Development to contribute to, or interfere with, the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the NAQS, (which also relate to compliance with local authority goals for LAQM and objectives set for the protection of human health).

8.3.60 In terms of the significance of the effects (consequences) of any adverse impacts, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development on local air quality or on amenity is found to be 'moderate' or 'major' this is deemed to be 'significant' for EIA purposes. Effects found to be 'minor' or 'negligible' are considered to be 'not significant'.

Sources of information/ data

8.3.61 The physical parameters for the modelling of emissions from the Proposed Development's stack(s) have been sourced from concept design data provided by design studies prepared for the Proposed Development, and the pollutant mass emission rates have been calculated by AECOM, based on licensor data, the relevant emission limits or BAT-AEL. They are summarised in **Appendix 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**), Table 1 - Table 3.

8.3.62 The dispersion modelling of point source emissions has taken into consideration the sensitivity of predicted results to model input variables, and to ultimately identify the realistic worst-case results for inclusion in the assessment. These variables include:

- meteorological data, for which five years' recent data (2015-2019) from a representative meteorological station (Doncaster Robin Hood Airport) have been used; and
- inclusion of buildings, structures and local topography that could affect dispersion from the source into the modelling scenarios, including the position of the absorber stack, as detailed in Paragraph 8.3.70 below.

Use of the Rochdale Envelope

8.3.63 A focused use of the Rochdale Envelope approach has been adopted to present a worst-case assessment of potential environmental effects of the different parameters of the Proposed Development that cannot yet be fixed. The parameters included within the Rochdale Envelope are described in **Chapter 4**: Proposed Development (ES Volume I – **Application Document Ref. 6.2**).

8.3.64 For this assessment, the preferred CCGT and post combustion amine technologies have not yet been selected and will be subject to further design and commercial engagement. Therefore, the emission parameters for the

CCGT unit and CCP proposed by the different technology licensors under consideration have been compared and although unlikely, the worst-case emissions leading to the worst-case predicted impacts has been used in the assessment, in order to ensure that it is conservative.

8.3.65 The operational Proposed Development site has been assumed to be running 24 hours a day for 8,760 hours per year for the purpose of carrying out a worst-case assessment, however it is likely that the plant may operate in dispatchable mode, with much lower running hours annually. This is because continuous operation throughout the year is considered to lead to worst-case annual average impacts.

8.3.66 Whilst it is recognised that during start-up and shut down there may be short periods where emissions concentrations from the CCP absorber(s) are higher than those assessed, there is limited data on the duration and release concentration of these emissions. Nevertheless, based on current understanding of the likely emissions during start-up, their duration and the fact that gas flow rates will be lower during start-up (thereby reducing mass emission rates), it is considered that effects will be comparable to or lower than those assessed for continuous operation.

8.3.67 The building dimensions included within the assessment are the maximum dimensions under consideration. It is envisaged that should the actual buildings be smaller in size, specifically in height, than those used in the assessment, then this would have the potential to reduce the plume downwash effects associated with buildings in close proximity to stack(s), therefore improving emission dispersion. This would lead to a reduction in the level of impact predicted in the assessment.

8.3.68 A range of stack heights were assessed at PEI stage, and in terms of the air quality impacts, the lowest stack height considered to be appropriate for the operational Proposed Development was reported.

8.3.69 As described in **Chapter 4**: The Proposed Development (ES Volume I – **Application Document Ref. 6.2**), consideration has been given to both a single large absorber and the option of a smaller twin absorber configuration with two stacks up to 74m high in determining worst-case assessments. As the single larger absorber unit provided the worst-case modelled results, these have been presented in this chapter.

8.3.70 In addition, there would be a stack from the heat recovery steam generator (HRSG) associated with the CCGT unit, which would only be operational when the Proposed Development is operating in an unabated mode (i.e. with no carbon capture taking place, as described in **Chapter 4**: Proposed Development (ES Volume I – **Application Document Ref. 6.2**).

8.3.71 Emissions from the CCGT HRSG stack have been considered (i.e. during unabated operation). However, as initial modelling showed that emissions from

the HRSG stack will lead to lower impacts than emission from the CCP absorber, these have not been presented in this chapter.

8.3.72 The location of stack(s) has not been finalised as detailed design of the Proposed Development has yet to be completed. Therefore, four assessment scenarios have been modelled, with the absorber building(s) and stack(s) separately assessed as being located at four corners of the proposed area within which the CCP would be developed (Work No. 1C on the Work Plans (**Application Document Ref. 4.3**). The worst-case results at any receptor have been reported in this assessment. This allows a robust assessment of air quality effects to be presented despite the design of this First of a Kind project not yet being completed.

Assessment Assumptions and Limitations

8.3.73 The data presented in this ES is based on the current understanding of the emissions performance of the Proposed Development. The assessed parameters and methodology used in the assessment of air quality impacts is detailed within this chapter and the supporting appendices (**Appendix: 8A**: Air Quality - Construction Phase and **Appendix: 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**).

8.3.74 The ADMS model used for the assessment of operational emissions from the Proposed Development includes a specific amine chemistry module, for the assessment of emissions of amines used in the CCP and their degradation products. The model calculates the rate of amine degradation following release from the emissions stack(s). The details of the amine chemistry and the assessment carried out of amine releases and their subsequent degradation products are detailed in **Appendix 8C**: Assessment of Amine Degradation Products (ES Volume II - **Application Document Ref. 6.3**). This assessment is based on the Environment Agency approach set out in a technical memo prepared by AQMAU (2020) and further informed by the approach proposed to the Environment Agency by AECOM in a subsequent technical memo (AECOM, 2021).

8.3.75 The final height of stack(s) for the operational Proposed Development is still to be determined, however the results reported in this assessment are considered to be associated with the lowest height of stack(s) that could be used, if the maximum building heights used the assessment are representative of the final design, and therefore represent a worst-case. Therefore, should the maximum building heights be reduced through detailed design, there may be potential to reduce the height of stack(s) accordingly, without increasing the predicted impacts. Any such reduction in stack height would be subject to further modelling to ensure that predicted impacts remained within those presented in this ES and controlled under the Environmental Permit.

8.3.76 Whilst ecological impacts are considered in this chapter, further information on the potential effects of the operational emissions from the Proposed

Development is discussed in **Chapter 11:** Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**).

8.4 Baseline Conditions

Existing Baseline -Sensitive Receptors

8.4.1 During the construction phase, based on IAQM guidance (IAQM, 2014) explained in paragraph 8.3.16, receptors potentially affected by dust soiling and short-term concentrations of PM_{10} generated during construction activities are limited to those

- human receptors: located within 350m of the nearest construction activity, and/ or within 50m of a public road used by construction traffic that is within 500m of the construction site entrance; and
- ecological receptors: located within 50m of the nearest construction activity and/ or within 50m of a public road used by construction traffic that is within 500m of the construction site entrance.

8.4.2 As described in **Chapter 5**: Construction Programme and Management (ES Volume I – **Application Document Ref. 6.2**) construction traffic would use the existing access road off the A18. Several properties are identified as relevant receptors along this construction route.

8.4.3 Receptors potentially affected by the exhaust emissions associated with construction phase vehicle movements are those located within 200m of a public road used by construction traffic to access the Proposed Development Site.

8.4.4 Receptors potentially affected by operational emissions from the Proposed Development including local residential and amenity receptors have been identified through site knowledge, desk study of local mapping and consultation. Through the dispersion modelling, isopleth figures of pollutant concentration dispersion have been examined, to identify the receptors that will receive the highest point source contributions so that the assessment of impact can be made at these receptors. Those receptors considered to be representative of impacts in the vicinity of the Proposed Development have been modelled as discrete receptors.

8.4.5 Ecological receptors potentially affected by operational emissions have been identified through desk study of Defra Magic mapping (Defra, 2020a) and consultation (see **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**)). Statutory designated sites including SAC, SPA, Ramsar sites and SSSI up to 15km from the Proposed Development Site have been considered. Several non-statutory designated sites including LNR and LWS within 2km have also been considered. Further details of these sites and reasons for designations are provided in **Chapter 11**:

Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**).

8.4.6 Identified receptors are detailed in Table 8.9 below and are shown in **Figure 8.1**: Air Quality – Operation Study Area Human Health Receptors, **Figure 8.2**: Air Quality – Operation Study Area Ecological Health Receptors and **Figure 8.3**: Air Quality – Construction Study Area (ES Volume III - **Application Document Ref. 6.4**). (TR = Traffic Receptor (for human health impacts), TE = Traffic Ecology, OR = Operational Receptor (for human health impacts), OE = Operational Ecology). The distances to the receptors from the Proposed Development Site are provided in the relevant **Appendix 8A**: Air Quality – Construction Phase and **Appendix 8B**: Air Quality – Operational Phase (ES Volume II - **Application Document Ref. 6.3**).

Table 8.9: Identified receptors with potential for air quality impacts from the Proposed Development

ID (refer to Figure 8.3 in ES Volume III)	Receptor name	Designation	Grid reference		Distance and direction from the operational Main Site	Shortest Distance to Road Source (m)
			X	Y		
TR1	Pilfrey Farm, A18	Residential	480758	409985	-	45
TR2	Property on Crowle Bank Road, Althorpe	Residential	482615	409594	-	10
TR3	Property on Kelsey Lane, Althorpe	Residential	483281	409791	-	15
TR4	Property on Old School Lane, Keadby	Residential	483863	410649	-	10
TR5	Property on Station Road, Keadby	Residential	483724	410668	-	5
TR6	Property on Station Road, Keadby	Residential	483691	410790	-	5
TR7	Property on Station Road, Keadby	Residential	483548	411238	-	5
TR8	Blacksmiths Cottage (former Trentvale Prep School), Keadby	Residential	483511	411611	-	5
TR9	Property on Trent Side, Keadby	Residential	483527	411804	-	5
TR10	Little Hurst Cottages, A161	Residential	478181	409792	-	10
TR11	Hirstwood Farm, A161	Residential	478347	409479	-	25

ID (refer to Figure 8.3 in ES Volume III)	Receptor name	Designation	Grid reference		Distance and direction from the operational Main Site	Shortest Distance to Road Source (m)
			X	Y		
TR12	Property at Mosswood Court, A161	Residential	478457	409228	-	65
TE1	Hatfield Waste Drain - North of A18	LWS	479055	410252	-	5
TE2	Hatfield Waste Drain - South of A18	LWS	478651	410338	-	25
TE3	North Engine Drain, Belton	LWS	479110	410221	-	10
TE4	River Torne	LWS	479108	410198	-	30
TE5	Three Rivers - South	LWS	480922	409925	-	10
TE6	South Engine Drain, Belton	LWS	480957	409898	-	5
TE7	Three Rivers - North	LWS	483532	411259	-	15
TE8	Stainforth and Keadby Canal Corridor	LWS	483434	411422	-	5
TE9	Keadby Wetland	LWS	483338	411379	-	105
TE10a – j[1]	Humber Estuary	Ramsar, SSSI and SAC	483561 – 483748	411266 - 411338	-	10 - 210
TE11a – j[1]	Humber Estuary	Ramsar, SSSI and SAC	484102 – 484065	410665 – 410865	-	5 - 175

ID (refer to Figure 8.3 in ES Volume III)	Receptor name	Designation	Grid reference		Distance and direction from the operational Main Site	Shortest Distance to Road Source (m)
			X	Y		
TE12	Hatfield Chase Ditches	SSSI	478707	410333	-	5
TE13a – j[1]	Crowle Borrow Pits	SSSI	479020 – 479056	410284 – 410468	-	30 - 220
OR1	Holly House	Residential	483036	411882	810m north-east	-
OR2	1 Trent Side, Keadby	Residential	483368	411284	1.3km south-east	-
OR3	North Pilfrey Farm	Residential	480853	411403	990m south-west	-
OR4	Keadby Grange	Residential	481565	410909	990m south	-
OR5	Pharon-Ville, Gunness	Residential	484057	411661	1.8km east	-
OR6	Boskeydyke Farm, Amcotts	Residential	483860	413348	2.0km north-east	-
OR7	Grange Cottage, Gunness	Residential	484708	412315	2.5km north-east	-
OR8	Pilfrey Farm	Residential	480769	409994	2.1km south-west	-
OR9	Thorne Village	Residential (requested receptors during consultation)	469571	412678	12.2km west	-
OR10	Vazon Bridge House		482507	411501	475m south	-
OR11	North Moor Farm		482875	412621	790m north-west	-
OE1 - 5[2]	Humber Estuary	Ramsar, SSSI and SAC	483573 – 483951	411823 - 412817	1.3km – 1.8km east	-

ID (refer to Figure 8.3 in ES Volume III)	Receptor name	Designation	Grid reference		Distance and direction from the operational Main Site	Shortest Distance to Road Source (m)
			X	Y		
OE6	Crowle Borrow Pits	SSSI	479102	410825	2.9km west	-
OE7	Hatfield Chase Ditches	SSSI	478769	410293	3.4km south-west	-
OE8	Eastoft Meadow	SSSI	478772	414311	3.7km north-west	-
OE9	Belshaw	SSSI	476961	406079	7.7km south-west	-
OE10	Thorne Moor	SAC, SPA and SSSI	475934	414720	6.3km north-west	-
OE11	Epworth Turbary	SSSI	475690	404195	9.8km south-west	-
OE12	Risby Warren	SSSI	491180	413564	9.1km east	-
OE13	Hatfield Moor	SAC, SPA and SSSI	471828	408178	10.4km west	-
OE14	Messingham Heath	SSSI	487748	403574	9.9km south-east	-
OE15	Tuetoes Hills	SSSI	484361	401698	10.4km south	-
OE16	Haxey Turbary	SSSI	475107	401866	11.9km south-west	-
OE17	Rush Furlong	SSSI	478141	400564	11.9km south	-
OE18	Hewson's Field	SSSI	478493	399614	12.7km south	-
OE19	Messingham Sand Quarry	SSSI	491394	404065	12.0km south-east	-
OE20	Manton and Twigmoor	SSSI	492895	405918	12.2km south-east	-
OE21	Scotton and Laughton Forest Ponds	SSSI	485863	399966	12.4km south	-

ID (refer to Figure 8.3 in ES Volume III)	Receptor name	Designation	Grid reference		Distance and direction from the operational Main Site	Shortest Distance to Road Source (m)
			X	Y		
OE22	Broughton Far Wood	SSSI	495776	410821	13.6km east	-
OE23	Broughton Alder	SSSI	495914	409994	13.9km east	-
OE24	Scotton Beck Field	SSSI	487885	399177	13.9km south-east	-
OE25	Scotton Common	SSSI	486951	398641	14.1km south	-
OE26	Laughton Common	SSSI	483534	397224	14.7km south	-
OE27	Stainforth and Keadby Canal Corridor	LWS	482055	411529	330m south	-
OE28	Keadby Wetland	LWS	482773	411433	695m east	-
OE29	Keadby Wet Grassland	LWS	482785	411409	710m east	-
OE30	Three Rivers	LWS	482956	411068	1.1km south-east	-
OE31	Ash Tip	N/A	481797	412068	Adjacent to west	-
OE32	Humber Estuary (at Blacktoft Sands)	Ramsar, SSSI, SAC and SPA	486210	421275	10.3km north-east	-

[1] Assessed along a transect at approximately 20m intervals to determine rate of decrease in pollutant.
[2] Locations along the riverside closest to the Proposed Development to determine likely area of maximum impact.

8.4.7 In addition, there are two additional SSSI within 15km of the Proposed Development (Conesby Quarry and Manton Stone Quarry) which are designated due to their geological features. It is therefore considered that these sites will not be affected by emissions from the Proposed Development, as the Critical Levels and Critical Loads assigned to such sites are for the protection of vegetation and ecosystems only, and therefore they have been screened from further assessment.

8.4.8 Three LWS (Keadby Boundary Drain, South Soak Drain and Keadby Warping Drain) have not been included in the assessment as the relevant habitats are aquatic, and therefore not considered to be sensitive to air quality impacts from Nitrogen. Guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM, 2021) states that *"Freshwater systems are generally phosphorus-limited....While the presence of nitrogen is not irrelevant, in most freshwater systems it is more important to control phosphorus inputs than nitrogen inputs. This is why phosphate discharge limits are often introduced on wastewater treatment works in order to protect freshwater habitats, but why nitrogen limits are rarely introduced to achieve the same objective. Phosphorus does not typically deposit from the atmosphere."*

Baseline Air Quality

8.4.9 Existing air quality conditions in the vicinity of the Proposed Development Site have been evaluated through a review of Local Authority air quality management reports, Defra published data and other sources. The key pollutants of concern resulting from construction and operation of the Proposed Development and that have potentially elevated background concentrations from other sources are NO_x, NO_2, CO, NH_3, PM_{10} and $PM_{2.5}$, therefore the assessment of baseline conditions within this chapter considers these pollutants only.

8.4.10 Baseline concentrations of the other pollutants such amines, nitrosamines and nitramines are considered in **Appendix 8C**: Air Quality - Assessment of Amine Degradation Products (ES Volume III - **Application Document Ref. 6.3**).

8.4.11 There is a single AQMA designated within the administrative boundary of NLC. The AQMA is approximately 6.2km from the Proposed Development and covers an area surrounding the steelworks to the east of Scunthorpe and was designated due to the exceedance of the PM_{10} 24 hour mean National Air Quality Objective. It is not considered that the Proposed Development will impact upon the air quality within the AQMA as the AQMA has not been declared for a pollutant species emitted from the operational Proposed Development .

8.4.12 NLC undertook automatic monitoring at 11 sites within their administrative area in 2018 and undertook monitoring for NO_2 using diffusion tubes at 22 locations.

8.4.13 The nearest automatic monitors are located approximately 7.5km from the Proposed Development site, within the AQMA on the eastern side of Scunthorpe. The main focus of these monitors is for PM_{10} due to the steelworks. Of the seven monitors within the study area, only two of them monitor NO_2 – CM1 (Scunthorpe Town AURN) and CM3 (Low Santon).

8.4.14 The annual mean concentration for NO_2 and for PM_{10} at CM1 (Scunthorpe Town AURN) in 2018 was 18µg/m^3. At CM3 (Low Santon) the annual mean concentration for NO_2 was 20µg/m^3 and for PM_{10} was 25µg/m^3. CM3 recorded 40 exceedances of the 24-hour mean PM_{10} objective.

8.4.15 There are three PM_{10} monitors located at Urban Background locations in Scunthorpe – CM2, CM4 and CM5. Annual mean concentrations of PM_{10} at these locations range from 18 - 21µg/m^3. A Rural monitoring site at Appleby (CM8, approximately 12.8km from the Main Site) recorded an annualised mean for PM_{10} of 15µg/m^3.

8.4.16 The nearest NO_2 diffusion tubes to the Proposed Development are approximately 4.5km to the east, located on Doncaster Road (DT3 and DT4) and Scotter Road (DT2, near junction with Doncaster Road). Doncaster Road is a major road from the A18 and M181 into the centre of Scunthorpe. Annual mean concentrations of NO_2 at these locations range between 19 - 24µg/m^3, well below the national objective value of 40µg/m^3.

8.4.17 The results of the monitoring indicate that air quality with NLC's administrative area is good, with only isolated short-term incidents of elevated concentration of PM_{10} due to the steelworks. The area surrounding the Proposed Development is not expected to experience these short-term incidents, and air quality at nearby receptors is expected to be better than that at the monitoring locations located in the more urban area around Scunthorpe.

8.4.18 The data for the monitoring sites that are considered to be relevant for the study area of the Proposed Development are detailed in Table 8.10 and Table 8.11 in **Appendix 8B:** Air Quality – Operational Phase (ES Volume II – **Application Document Ref. 6.3**) and the locations of all the monitoring sites (automatic and diffusion tubes) used in the assessment are shown in **Figure 8.5** (ES Volume III – **Application Document Ref. 6.4**) .

Table 8.10: NLC Monitored Annual Mean Nitrogen Dioxide Concentrations

Site ID	Monitoring location	Site type	Grid reference		2018 Annual Mean conc^{n} (µg/m^3)
			X	Y	
CM1	Scunthorpe Town AURN	Industrial (automatic)	490320	410831	18

Site ID	Monitoring location	Site type	Grid reference		2018 Annual Mean conc^{n} (µg/m^3)
			X	Y	
CM3	Low Santon	Industrial (automatic)	492945	411931	20
DT2	Scotter Road	Roadside (Diffusion Tube)	487239	411259	24
DT3	B&Q	Roadside (Diffusion Tube)	486699	411110	19
DT4	Hilton Avenue	Roadside (Diffusion Tube)	486928	411156	20

Table 8.11: NLC Monitored Annual Mean PM_{10} Concentrations

Site ID	Monitoring location	Site type	Grid reference		2018 Annual mean conc^{n} (µg/m^3)
			X	Y	
CM2	East Common Lane	Urban Background (automatic)	490663	409789	21
CM4	Redbourn Club	Urban Background (automatic)	490002	410069	18
CM5	Lakeside	Urban Background(automatic)	491750	408127	20
CM8	Appleby	Rural (automatic)	495075	414767	15

8.4.19 Background data has also been obtained from Defra published maps (Defra, 2020b) for the locations of likely maximum impact from point source emissions from the Proposed Development, and at identified sensitive receptor locations.

8.4.20 For the construction (2025 peak construction year) baseline, background mapping data for 2025 was used alongside Long Term Trent (LTT) Gap Analysis as outlined in DMRB guidance (Highways England, 2019) which accommodates for discrepancies between roadside NO_2 projections and vehicle fleet emission projections. More information regarding this process can be found in **Appendix 8A**: Air Quality – Construction Phase (ES Volume II – **Application Document Ref. 6.3**). This is considered to be a robust approach

in dealing with the uncertainty in future year conditions for road traffic emissions assessments.

8.4.21 Background mapping data for 2018 (based on 2018 background maps) (Defra, 2020b) is conservatively assumed to be representative of the opening (2026) baseline; as general trends are showing a reduction in both NO_2 and PM_{10} concentrations over time, this is considered to be a conservative assumption.

8.4.22 Background data from the Defra background maps for the receptors and roads in the vicinity of the Proposed Development is provided in Table 8.12 and indicates NO_2, CO, PM_{10} and $PM_{2.5}$ concentrations are consistently well below the relevant AQAL. Short term background concentrations are assumed to be twice the annual mean, in line with the Environment Agency's guidance, and are shown in brackets in Table 8.12.

Table 8.12: Defra Background Maps Pollutant Concentrations - 2018

Receptors	Grid Reference of Centre Point	Annual Mean Concentration (µg/m^3)				
		NOx	NO_2	CO[a]	PM_{10}	$PM_{2.5}$
TR1, OR8	480500, 409500	11.6 (23.2)	8.9 (17.8)	112.7 (225.3)	16.4 (32.8)	9.0 (18.1)
TR2	482500, 409500	11.6 (23.2)	8.9 (17.8)	114.4 (228.8)	16.4 (32.8)	9.0 (18.0)
TR3	483500, 409500	12.2 (24.3)	9.3 (18.6)	114.8 (229.7)	16.1 (32.3)	9.0 (18.1)
TR4, TR5, TR6	483500, 410500	12.7 (25.4)	9.7 (19.3)	111.8 (223.6)	15.7 (31.4)	9.0 (17.9)
TR7, TR8, TR9, OR1, OR2	483500, 411500	12.2 (24.3)	9.3 (18.6)	111.8 (223.6)	15.0 (30.0)	8.7 (17.4)
TR10, TR11, TR12	478500, 409500	11.9 (23.7)	9.1 (18.2)	113.5 (227.1)	16.6 (33.1)	9.1 (18.3)
OR3	480500, 411500	12.1 (24.2)	9.2 (18.5)	109.6 (219.2)	16.0 (32.1)	8.8 (17.7)
OR4	481500, 410500	11.2 (22.4)	8.6 (17.2)	110.5 (221)	16.1 (32.1)	8.8 (17.6)
OR5	484500, 411500	12.4 (24.7)	9.4 (18.8)	114.4 (228.8)	15.4 (30.8)	8.8 (17.5)
OR6	483500, 413500	10.9 (21.9)	8.4 (16.8)	110.1 (220.1)	16.0 (32.0)	8.8 (17.5)

Receptors	Grid Reference of Centre Point	Annual Mean Concentration (µg/m^3)				
		NOx	NO_2	CO[a]	PM_{10}	$PM_{2.5}$
OR7	484500, 412500	12.3 (24.5)	9.3 (18.7)	126.2 (252.3)	15.0 (29.9)	8.5 (17.1)
OR9	469500, 412500	-	11.6 (22.69)	-	-	-
OR10	482500, 411500	12.5 (25.0)	9.5 (19.0)	111.8 (223.6)	15.6 (31.2)	8.7 (17.4)
OR11	482500, 412500	11.2 (22.4)	8.6 (17.2)	111.0 (222.0)	16.0 (32.0)	8.8 (17.6)

[a] Background concentrations of CO are from the 2001 background maps scaled to 2018 concentrations

8.4.23 The Defra NO_2 background mapping data is lower than the automatic monitoring data from the Urban Background monitoring locations in NLC's administrative area, whereas the Defra PM_{10} concentration is consistent with concentrations monitored at CM8 (a rural monitor).

8.4.24 The background data selected for the assessment is detailed and justified within the accompanying appendices to this chapter (**Appendix 8A**: Air Quality - Construction Phase and **Appendix 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**)).

8.4.25 Baseline pollutant concentrations at human health receptors show that concentrations of all pollutants are well below all AQAL for all pollutants, indicating that there are no potential breaches of the standards in the vicinity of the Proposed Development.

8.4.26 The baseline NO_x pollutant concentrations and acid and nutrient nitrogen deposition rates at the identified statutory designated ecological receptors have been obtained from APIS and are provided in **Appendix 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**).

Future Baseline Air Quality

8.4.27 Background concentrations of pollutants are expected to decrease in the future due to changes in technology and the types of emission sources; however, to provide a conservative prediction of pollutant concentrations in the future, the current baseline background concentrations are used for the future operational assessment scenarios, assuming no decrease in background concentrations. For future construction assessment scenarios, LTT Gap Analysis was used to provide a robust prediction of pollutant concentrations in the future.

8.5 Development Design and Impact Avoidance

Construction

Construction environmental management plan (CEMP)

8.5.1 Emissions of dust and particulates from the construction phase of the Proposed Development will be controlled in accordance with industry best practice, through incorporation of appropriate control measures according to the risks posed by the activities undertaken, as determined through this assessment process. The management of dust and particulates and application of adequate mitigation measures will be enforced through embedding measures in the CEMP. A Framework CEMP is included as **Application Document Ref. 7.1**. The final CEMP will be developed in accordance with the principles set out in the framework.

8.5.2 Based on an initial assessment of the Proposed Development Site and surrounding area, of its sensitivity to dust impacts and the likely risk of impacts arising from each of the key construction activities (earthworks, construction and 'trackout' of material onto roads (see **Appendix 8A**: Air Quality - Construction Phase (ES Volume II - **Application Document Ref. 6.3**)), appropriate embedded measures to be implemented during construction (good site techniques drawn from the 'high risk' site schedule in IAQM guidance) that have been identified are:

- avoid mechanical roughening or grinding of concrete surfaces, where appropriate;
- store sand and aggregates in bunded areas and store cement powder and fine materials in silos, where appropriate;
- use water suppression and regular cleaning to minimise mud on roads, and control dust during earth moving activities;
- cover vehicles leaving the construction site that are carrying waste materials or spoil;
- employ wheel wash systems at site exits;
- restrict, where practicable, the use of unmade road accesses;
- minimising duration of storage of topsoil or spoil during pipeline construction; and
- prohibit open fires on site.

8.5.3 Good practice will also be employed for the siting and operation of NRMM to control associated emissions, including:

- minimise vehicle and plant idling;
- where reasonably practicable, locating static plant away from sensitive boundaries or receptors; and

- minimise operating time outside of core working hours/ daylight hours.

Operation

IED/ BAT-AEL Emission Limit Value (ELV) compliance

8.5.4 The Proposed Development will be designed such that process emissions to air comply with the ELV requirements specified in the IED, or, if tighter, the LCP BRef. This will be regulated by the Environment Agency through the Environmental Permit required for the operation of the Proposed Development. The Environmental Permit may also include additional ELV for species not covered under the IED or LCP BRef.

Stack height(s)

8.5.5 The proposed height of absorber stack(s) for the Proposed Development has been assessed as a worst-case with consideration given to minimisation of ground-level air quality impacts and the visual impacts of taller stacks, based on current worst-case building massings of the main structures of the Proposed Development.

8.5.6 Dispersion modelling has been undertaken to determine the optimum height of absorber stack(s) at the current stage of design, through comparison of the maximum impacts at human health and ecological receptors, to result in impacts at sensitive receptors that are considered to be acceptable.

8.5.7 At the detailed design stage, should the final building dimensions be reduced from those assessed in this ES, lower stack heights may be able to be used to achieve the same level of effect as presented in this chapter.

8.5.8 The location of the HRSG stack and absorber stack(s) will be controlled by the Works Plans (**Application Document Ref. 4.3**). Emissions from the CCGT stack have not been assessed, as it is considered that this will lead to lower impacts than emission from the CCP absorber. The combustion emissions (NO_x and CO) and NH_3 from the SCR would be subject to the same emission limits from the HRSG as from the CCP absorber stack and therefore the associated release rates would be comparable. The emissions from the HRSG stack however would be released at a higher temperature than from the absorber and would therefore have improved thermal buoyancy, and consequentially dispersion, resulting in a level of impact for the unabated CCGT operation that is better than – or no worse than - for the carbon capture mode of operation. The HRSG stack would be sized appropriately to ensure that this is the case although would not exceed the maximum parameters stated in Table 4-1 (**Chapter 4:** The Proposed Development (ES Volume I – **Application Document Ref. 6.2**).

Emissions Control

8.5.9 The impact assessment is based on emissions performance from the CCP that licensors have confirmed is achievable through a combination of solvent selection and process control techniques. Emissions of NO_x from the CCGT will be controlled through the use of SCR so as to minimise NO_x carry over into the CCP.

8.5.10 Emissions of amines will be controlled in accordance with the use of BAT through the use of water wash stages prior to the flue gas exiting the stack; the use of water wash enables solvent that is carried over in the flue gas to be captured and returned to the process for re-use.

8.5.11 Emissions of ammonia may need to be controlled through the use of an acid wash stage after the water wash. This uses sulphuric acid to remove the ammonia from the flue gas; this may be required to meet a proposed ELV so as to not give rise to unacceptable ammonia or nitrogen deposition effects. The use of an acid wash may represent BAT depending on the nature of the solvent used. It may also further reduce the release of amine from the stack(s), thereby reducing the formation of amine degradation products.

8.5.12 Another measure that helps improve dispersion from the stack is the use of reheat to raise the stack gas temperature from around 35°C to around 60°C.

8.5.13 The air assessment has assessed both the use of acid wash and the use of reheat; the decision as to whether either control techniques is required will depend on the emissions associated with the chosen licensor's proprietary solvent, and therefore will be made at the FEED stage. Control of operational emissions will be made through a BAT justification and via the Environmental Permit.

Decommissioning

8.5.14 Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Decommissioning Environmental Management Plan (DEMP), proposed to be secured by a Requirement in the draft DCO (**Application Document Ref 2.1**); no additional mitigation for decommissioning of the Proposed Development beyond such best practice is considered necessary at this stage. The predicted air quality effects of eventual decommissioning of the Proposed Development are considered to be comparable to, or less than, those assessed for construction activities.

8.6 Likely Impacts and Effects

Construction

Assessment of construction dust

8.6.1 The area sensitive to dust soiling and PM_{10} health effects has been assessed, as detailed in **Appendix 8A**: Air Quality – Construction Phase (ES Volume II –

Application Document Ref. 6.3), from the sensitivity of receptors and the proximity of the Proposed Development activities to these receptors. Identified sensitive receptors to dust soiling and PM_{10} effects from construction works are detailed in Table 7 of **Appendix 8A:Error! Reference source not found.** Air Quality – Construction Phase (ES Volume II – **Application Document Ref. 6.3**).

8.6.2 A number of residential receptors (high sensitivity) and ecological receptors (low to medium sensitivity where they are local wildlife sites; high sensitivity where they are internationally/ nationally designated i.e. the Humber Estuary RAMSAR, SAC and SSSI) have been identified within 350m of the site boundary or site exit (Table 7 in **Appendix 8A:** Air Quality - Construction Phase (ES Volume II – **Application Document Ref. 6.3**)). The assessment has considered risks from demolition/ site clearance works, earthworks, construction and trackout (of mud to the road) and, based on the potential scale of activities and the sensitivity of the receptor area, (as defined in **Appendix 8A:** Air Quality - Construction Phase (ES Volume II – **Application Document Ref. 6.3**)) unmitigated dust impacts are considered to be 'medium to high risk' for human health receptors, and 'medium risk' for ecological receptors. Therefore, mitigation measures appropriate to the scale of perceived risk would be applied as part of the CEMP.

Assessment of construction traffic

Table 16 of **Appendix 8A**: Air Quality - Construction Phase (ES Volume II – **Application Document Ref. 6.3**) shows the predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$; and number of exceedances of the 24-hour 50 µg/m^3 PM_{10} objective for the Do Something scenario at the worst-case receptor. Table 18 and Table 19 of **Appendix 8A** (ES Volume II – **Application Document Ref. 6.3**) show the relevant information and assessment results for the significance of construction traffic impacts on ecological receptors.

8.6.3 The impact at all human receptors can be considered negligible, as both the change between the Do Minimum and Do Something scenarios for all receptors is less than 1% of the AQAL; and all receptors are below 75% of the AQAL.

8.6.4 Despite there being some sensitive human receptors along roads where construction traffic will be present, the largest change in AADT flow occurs on the A18 to the west of the construction site access, and along the A161. The effects of changes in pollutant concentrations due construction traffic and changes in traffic flows on the road network is considered not to be significant, given that the magnitude of change between the two scenarios is so small where human receptors are present.

8.6.5 The impacts at all nationally and internationally designated ecological receptors (TE10-TE13) are considered unlikely to give rise to significant effects as the change in pollutant concentrations are less than 1% of the relevant Critical Level or Critical Load, or that these are not exceeded.

8.6.6 At locally designated sites (TE1-E9), predicted changes in pollutant concentrations are less than 100% of the short- and long-term AQAL, and it is considered that this is unlikely to give rise to significant effects.

8.6.7 The effect of changes in traffic flows due to construction traffic on human health and ecological receptors is therefore considered to be negligible (**not significant**).

Assessment of emissions from construction site plant (NRMM)

8.6.8 The assessment has identified no sensitive human receptors within 200m of the Proposed PCC Site, however there are a number close to the Water Connection and Discharge Corridors, laydown areas and the Additional Abnormal Indivisible Load (AIL) route. Construction activities in these areas are described in **Chapter 5**: Construction Programme and Management (ES Volume I – **Application Document Ref. 6.2**). As works within these areas will be phased, NRMM and site plant will only be required to be operational at that nearest location for a limited duration over the overall construction period, and only operational on an 'as and when required' basis during that particular phase. Emissions from site plant and NRMM will also be controlled by measures set out in the Framework CEMP (**Application Document Ref. 7.1**) to reduce emissions associated with this source, including restriction of their operation within designated areas only, prohibiting of idling, the enforcement a minimum engine emissions standard and enforcement of maximum site speed limits. Due to these proposed controls, it is considered that the potential for NRMM emissions within the Proposed Development Site to result in air quality impacts on local human health receptors is considered negligible with reference to the IAQM/ EPUK screening criterion. The effect of NRMM emissions on human health receptors at the Proposed PCC Site is therefore considered to be **not significant**.

8.6.9 The ecologically sensitive Humber Estuary Ramsar, SSSI and SAC is located within the Proposed Development Site boundary. The requirement for any plant to be operational within the Humber Estuary Ramsar, SSSI and SAC will be dependent on the final cooling water option selected. If the preferred Canal Water Abstraction Option (Work 4A) is chosen, there will be no requirement for a cofferdam within the River Trent, and therefore no emissions from construction works, site plant and NRMM.

8.6.10 In the event that the River Water Abstraction Option (Work 4B) is required, however, due to the phased nature of the construction works, site plant and NRMM will only be required to be operational within the Ramsar/ SSSI/ SAC for a limited duration of up to circa 3 months on two occasions over the overall construction period, and only operational on an 'as and when required' basis during that particular phase. Emissions from site plant and NRMM will also be controlled by measures set out in the CEMP to reduce emissions associated with this source, including restriction of their operation within designated areas only, prohibiting of idling and the enforcement a minimum engine emissions

standard. Due to the limited number of site plant and NRMM anticipated to be in use on the works section of the Site closest to the estuary, the limited number and intermittent hours of operation it is considered that the any impact experienced on the Ramsar/ SSSI/ SAC as a result of site plant and NRMM emissions is likely to be negligible (**not significant**).

Abnormal loads (waterborne transport)

8.6.11 **Chapter 5**: Construction Programme and Management (ES Volume I – **Application Document Ref. 6.2**) explains that a number of AIL movements are expected during the construction programme associated with the delivery of large items of plant and equipment. The exact number and size/ weight is not known at this stage and is based on specific construction methodologies that will be confirmed during front end engineering design (FEED). However, around 35 - 40 such deliveries are expected over a 12 month period.

8.6.12 Consistent with the AIL delivery strategy for Keadby 2 Power Station which is undergoing construction, it is expected that the largest abnormal loads will be received at the Port of Immingham and barged down the River Trent to the Waterborne Transport Offloading Area at Railway Wharf, which is included within the Order Limits for the Application (refer to **Figure 3.3** in ES Volume III - **Application Document Ref. 6.4**). The components will then be lifted using a mobile crane onto a hauled trailer and transported to the Proposed Development Site crossing the B1392 onto the temporary haul road that runs to the east of PD Port Services. This is an existing haul road and is also included within the Order Limits.

8.6.13 The smaller abnormal loads are expected to be transported by road from Immingham Dock via the M180 to Junction 2 and then from the A161 to the A18, entering the Proposed Development Site via the skew or perpendicular access off the A18. Should it be necessary, a small number of AIL could also be delivered on an alternative route consented for Keadby 2 Power Station from Ealand village via the A161, New Trent Road and Bonnyhale Road, avoiding North Pilfrey Bridge. Each of these AIL routes are shown in the Framework CTMP (**Application Document Ref. 7.2**).

8.6.14 Due to the limited number of vehicles and river vessels accessing these routes, the limited duration of activities and the intermittent hours that the routes will be used, it is considered that the impact on the RAMSAR/ SSSI/ SAC and human health receptors is likely to be negligible (**not significant**).

Operation

Process Emissions from the Operational CCP

8.6.15 The impact of point source emissions from the CCP at human health receptors has been determined from isopleth figures of pollutant dispersion and maximum model outputs at discrete receptor locations. The maximum hourly, daily and

annual mean predicted concentrations have been compared with the relevant AQAL, as summarised in Table 8-13.

8.6.16 The results have been initially presented as the maximum concentration that occurs anywhere from just the operation of the Proposed Development, whether this corresponds to a receptor location or not. The detailed concentrations at all identified receptor locations are provided in Table 11 – Table 13 of **Appendix 8B**: Air Quality – Operational Phase (ES Volume II – **Application Document Ref. 6.3**).

8.6.17 The background concentrations in Table 8-13 have been modified to include the modelled contribution from the Keadby 2 Power Station CCGT, as this will be operational when the Proposed Development commences operation. This is only applicable for emissions of NOx, CO and NH_3, as these are the only species that will be released from both sources.

8.6.18 Isopleth figures showing the maximum predicted annual and short-term process contributions of NO_2 and NO_x are provided in **Figures 8.5 – 8.8** (ES Volume III - **Application Document Ref. 6.4**).

8.6.19 The dispersion modelling includes a number of conservative assumptions in combination, including:

- reporting of the worst-case results from the five years of meteorological data modelled;
- maximum building sizes within the assessed Rochdale Envelope;
- maximum annual operation for the plant configuration assessed (8,760 hours, assuming the plant is used for baseloading as a worst-case);
- operation of the plant at proposed emission limits, or maximum concentrations provided by all licensors, when annual average emissions are likely to be below these;
- presentation of the worst-case impacts from assessment of the absorber stack(s) being in four locations within the Proposed PCC Site; and,
- conservative estimates of background concentrations for the commencement of operation at the receptor locations.

8.6.20 The methodology and the full result of the assessment of N-amines is provided in **Appendix 8C**: Air Quality Assessment of Amine Degradation Products (ES Volume II – **Application Document Ref. 6.3**).

Table 8.13: Results of operational impact assessment for human health impacts – maximum location

Species	AQAL ($\mu g/m^3$)	Proposed Development Only			Background Concentrations (BC)		PEC ($\mu g/m^3$)	PEC/ AQAL %	Significance of effect
		PC ($\mu g/m^3$)	PC/ AQAL %	Magnitude of impact	Existing ($\mu g/m^3$)	With K2 ($\mu g/m^3$)			
NO_2 hourly mean (as the 99.79th percentile)	200	24.6	12%	Minor	19.0	20.0	44.7	22%	Negligible adverse (**not significant**)
NO_2 annual mean	40	0.8	2%	Low	9.5	10.0	10.9	27%	Negligible adverse (**not significant**)
CO 1-hour mean (as the 100th percentile)	30,000	459	2%	Insignificant	252	547	1,0065	3%	Negligible adverse (**not significant**)
CO 8-hour rolling average	10,000	190	2%	Insignificant	252	547	737	7%	Negligible adverse (**not significant**)
NH_3 1-hour mean	2,500	6.8	0.3%	Insignificant	3	3.2	10.0	0.4%	Negligible adverse (**not significant**)

Species	AQAL ($\mu g/m^3$)	Proposed Development Only			Background Concentrations (BC)		PEC ($\mu g/m^3$)	PEC/ AQAL %	Significance of effect
		PC ($\mu g/m^3$)	PC/ AQAL %	Magnitude of impact	Existing ($\mu g/m^3$)	With K2 ($\mu g/m^3$)			
NH_3 annual mean	180	0.04	0.02%	Imperceptible	1.5	1.6	1.6	0.9%	Negligible adverse (**not significant**)
Amines (as MEA) 1-hour mean (as the 100th percentile)	400	25.2	6%	Insignificant	-	-	25.2	6%	Negligible adverse (**not significant**)
Amines (as MEA) Annual mean	100	0.22	0.2%	Imperceptible	-	-	0.22	0.2%	Negligible adverse (**not significant**)
Acetaldehyde 1-hour mean (as the 100th percentile)	9,200	24.3	0.3%	Insignificant	-	-	24.3	0.3%	Negligible adverse (**not significant**)
Acetaldehyde Annual mean	370	0.21	<0.1%	Imperceptible	-	-	0.21	<0.1%	Negligible adverse (**not significant**)

Species	AQAL ($\mu g/m^3$)	Proposed Development Only			Background Concentrations (BC)		PEC ($\mu g/m^3$)	PEC/ AQAL %	Significance of effect
		PC ($\mu g/m^3$)	PC/ AQAL %	Magnitude of impact	Existing ($\mu g/m^3$)	With K2 ($\mu g/m^3$)			
Formaldehyde 1-hour mean (as the 100th percentile)	100	2.3	2.3%	Insignificant	-	-	2.3	2.3%	Negligible adverse (**not significant**)
Formaldehyde Annual mean	5	0.02	0.4%	Imperceptible		-	0.02	0.4%	Negligible adverse (**not significant**)
Ketones 1-hour mean (as the 100th percentile)	89,500	22.9	<0.1%	Insignificant	-	-	22.9	<0.1%	Negligible adverse (**not significant**)
Ketones Annual mean	6,000	0.2	<0.1%	Imperceptible	-	-	0.2	<0.1%	Negligible adverse (**not significant**)

PC = Process Contribution, AQAL = Air Quality Assessment Level, BC = Background Concentration, PEC = Predicted Environmental Concentration

8.6.21 The impacts of all pollutant species released from the operational Proposed Development are predicted to result in negligible adverse effects at all receptors within the study area. The impact of NO_2, CO, NH_3, amines, acetaldehyde, formaldehyde and acetic acid can therefore be considered to be (**not significant**) at all human health receptors.

8.6.22 As stated previously, at this stage in the design process, information on the potential for higher short term emissions during start-up is not available. However, it should be noted that the predicted effects of short-term emissions when assessed against long term average emissions are well below the criteria to show insignificance against the short term AQAL, so in the event that start-up emissions are higher, there is significant headroom in the assessment before significant effects would be realised.

8.6.23 The effects of amine degradation products are discussed in **Appendix 8C**: Air Quality Assessment of Amine Degradation Products (ES Volume II – **Application Document Ref. 6.3**). The representative assessment of degradation products shows that the effects from the Proposed Development are well below the proposed Environment Agency EAL for N-amines. The worst case N-amine concentration at a sensitive receptor is less than 20% of the EAL and this is when applying conservative assumptions such as the use of the NDMA EAL to represent the effects of all N-amine species.

8.6.24 The impact of point source emissions at ecological receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at the discrete receptor locations. The maximum daily and annual mean predicted concentrations have been compared with the relevant AQAL, as summarised in Table 8.12. The full results for each receptor are provided in **Appendix 8B**: Air Quality – Operational Phase, Tables 14 - 15 (ES Volume II – **Application Document Ref. 6.3**) with depositional impacts presented in Tables 16 - 17.

Table 8.14: Results of operational impact assessment for worst-case ecological receptor impacts

Species	AQAL ($\mu g/m^3$)	Proposed Development Only			Background Concentrations		PEC ($\mu g/m^3$)	PEC/ AQAL %	Significance of effect
		PC ($\mu g/m^3$)	PC/ AQAL %	Magnitude of impact	Existing ($\mu g/m^3$)	With K2 ($\mu g/m^3$)			
Worst-case receptor NO_x daily mean (as the 100th percentile) Three Rivers LWS	75	21.9	29%	Medium	19.6	19.9	41.8	56%	**Not significant**[2]
Worst-case receptor NO_x annual mean Humber Estuary Ramsar/ SAC/ SSSI	30	0.49	1.6%	Low	13.0	13.7	14.2	47%	Negligible adverse (**not significant**)

[2] As described in paragraph 8.3.53, for local nature sites, such as LWS, the Environment Agency's guidance states that where the short or long-term PC is less than 100% of the respective standard, then there are unlikely to be significant effects due to changes in air quality.

Species	AQAL ($\mu g/m^3$)	Proposed Development Only			Background Concentrations		PEC ($\mu g/m^3$)	PEC/ AQAL %	Significance of effect
		PC ($\mu g/m^3$)	PC/ AQAL %	Magnitude of impact	Existing ($\mu g/m^3$)	With K2 ($\mu g/m^3$)			
Worst-case receptor NH_3 annual mean Humber Estuary Ramsar/ SAC/ SSSI	3	0.02	0.5%	Imperceptible	2.3	2.4	2.4	79%	Negligible adverse (**not significant**)
Worst-case receptor NH_3 annual mean Risby Warren SSSI	1	0.003	0.3%	Imperceptible	3.2	3.2	3.2	324%	Negligible adverse (**not significant**)

PC = Process Contribution, AQAL = Air Quality Assessment Level, BC = Background Concentration, PEC = Predicted Environmental Concentration

8.6.25 The impacts of daily NO_x at the worst-affected ecological receptor (Three Rivers LWS) has been assessed as a medium magnitude of impact. The PEC (41.8µg/m^3) indicates that an exceedance of the daily critical level (75µg/m^3) is very unlikely, with impacts at 56% of the critical level. It is therefore considered that the effect of this is **not significant**, given that the Environment Agency guidance states that where the short or long term PC at LWS is <100% of the critical level, there are unlikely to be significant effects due to changes in air quality (refer to paragraph 8.3.53).

8.6.26 Annual average impacts of NO_x at the worst-affected receptor (Humber Estuary Ramsar/ SAC/ SSSI) are considered to have a negligible adverse impact and therefore effects are considered to be **not significant**. This is because emissions are under the threshold to be determined as not significant (70%), given that the PEC is 47% of the relevant critical level.

8.6.27 The annual mean NH_3 impacts at the worst-affected ecological receptor (Humber Estuary Ramsar/ SAC/ SSSI) represent 0.5% of the relevant critical level and therefore represent an imperceptible magnitude of impact. Due to the high background of NH_3 in the area, the background alone represents 79% of the critical level, and therefore the PEC represents 79% of the critical level, resulting in a negligible adverse impact. The impact on the habitat site as a whole is considered to be **not significant**.

8.6.28 Annual average impacts of NH_3 for the worst-affected receptor sites that are assigned the lower NH_3 critical level for the protection of lichens and bryophytes also has an imperceptible magnitude of impact, being under the threshold of insignificance noted in paragraph 8.3.51 (Long term PC <=1% AQAL) at 0.5% of the critical level. This level of impact is predicted to occur at Risby Warren SSSI circa 9km from the Main Site, where the background concentration of NH_3 is already exceeding the critical level. This results in a negligible adverse magnitude of impact on this site. This level of impact from the Proposed Development is therefore **not significant**.

8.6.29 The significance of this effects is further considered further in **Chapter 11:** Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2**).

Decommissioning

8.6.30 The predicted air quality effects of eventual decommissioning of the Proposed Development are considered to be comparable to, or less than, those assessed for construction activities i.e. **not significant**. This is based upon the assumption that groundwork, traffic movements and site work likely to be required to decommission the Proposed Development would be less than that required for its construction. Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a DEMP; no additional mitigation for decommissioning of the Proposed Development beyond such best practice is considered necessary at this stage.

8.7 Mitigation, Monitoring and Enhancement Measures

8.7.1 The management of construction phase emissions, including dust and particulates, and the application of adequate mitigation measures will be enforced through the CEMP, and through the application of appropriate mitigation according to the risk of dust emissions from Proposed Development Site activities as identified in this assessment.

8.7.2 The environmental effects from construction traffic associated with the Proposed Development have been identified as not significant, therefore no specific additional mitigation has been identified as necessary for the construction phase of the Proposed Development, other than the measures outlined in Sections 8.5 and 8.6 of this Chapter.

8.7.3 The air quality assessment of operational impacts has assumed that the ELV will be met for the operational plant as required under the IED and in accordance with use of BAT under the environmental permitting regime. The environmental effects from operation of the Proposed Development have been identified as not significant at all human health receptors for the operation of the Proposed Development.

8.7.4 The air assessment has assessed either the use of acid wash or the use of reheat as potential additional mitigation for ammonia emissions; the decision as to whether either control techniques is required will depend on the emissions associated with the chosen licensor's proprietary solvent, and therefore will be made at the FEED stage.

8.7.5 Detailed modelling of predicted impacts at ecological receptors indicates that potential effects at ecological receptors as a result of the operation of the Proposed Development cannot be completely screened out as insignificant. Further assessment of the predicted effects at ecological receptors and the determination of the significance of these effects has therefore be assessed further in **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – **Application Document Ref. 6.2)** and in the Habitat Regulations Assessment Screening Report (**Application Document Ref. 5.12**).

8.7.6 No specific additional mitigation has been identified as necessary for the operation or decommissioning phases of the Proposed Development other than the embedded mitigation measured outlined in the Assessment of Likely Impacts and Effects Section.

8.7.7 The measures proposed to avoid and reduce, where possible, significant adverse effects on the environment are set out in Sections 8.5 and 8.7 of this chapter. The monitoring strategies to track the delivery and success of design elements and proposed mitigation for construction phases are set out in the Framework CEMP (**Application Document Ref. 7.1**).

8.7.8 Monitoring strategies for the operational plant will be enshrined within the Environmental Permit and are likely to require continuous monitoring of key

pollutant emissions from stack(s), with annual reporting of results to the Environment Agency and annual independent validation of the monitoring results.

8.8 Limitations or Difficulties

8.8.1 Until the preferred technology provider is selected, there will be some degree of uncertainty in the operational emissions used in the assessment. Therefore, in order to minimise the likelihood of under-estimating the predicted impacts for the operational emissions, a number of conservative assumptions have been made in the assessment. The conservative assumptions used in the assessment are detailed in Section 6 of **Appendix 8B**: Air Quality - Operational Phase (ES Volume II – **Application Document Ref. 6.3**).

8.8.2 There is also uncertainty associated with any modelling assessment, due to the inherent uncertainty of the dispersion modelling process itself. Despite this, the use of dispersion modelling is a widely applied and accepted approach for the prediction of impacts from industrial and transport sources.

8.9 Summary of Likely Significant Residual Effects

Construction and decommissioning

8.9.1 The air quality assessment of construction impacts assumes that the measures outlined within Section 8.6 of this Chapter would be incorporated into the design of the Proposed Development, as they are standard best practice measures that are routinely applied across UK construction sites. No additional mitigation has been identified as necessary for the construction phase of the Proposed Development. For this reason, the residual effects would be as reported within Section 8.6 of this Chapter (i.e. **not significant**).

8.9.2 Consistent with construction mitigation, it has been assumed that relevant best practice mitigation measures would be in place during any decommissioning works. No additional mitigation has been identified as necessary for the decommissioning phase of the Proposed Development.

Operation

8.9.3 The air quality assessment of impacts at opening has assumed that the ELV will be met for the operational plant as required and in accordance with use of BAT under the environmental permitting regime. The use of acid wash and/ or reheat has been identified as potentially necessary for the operational phase of the Proposed Development. For this reason, the residual effects would be as reported within the Mitigation and Enhancement Measures Section of this chapter.

Cumulative Effects

8.9.4 An assessment of cumulative impacts with other proposed developments that could interact with the impacts and effects of this Proposed Development have been assessed within **Appendix 8B**: Air Quality – Operational Phase (ES Volume II - **Application Document Ref. 6.3**) and summarised in **Chapter 19**: Cumulative and Combined Effects (ES Volume I – **Application Document Ref. 6.2**). The impact of cumulative operational emissions on nutrient nitrogen deposition for relevant habitats is considered in the Habitats Regulations Assessment Screening Report (**Application Document Ref. 5.12**).

8.10 References

AECOM (2021). Amines Degradation Dispersion Modelling Memo to the Environment Agency.

Cambridge Environmental Research Consultants (CERC). Atmospheric Dispersion Modelling System (ADMS) Roads dispersion model (version 5.0.0).

Centre for Ecology and Hydrology and APIS (2016) Critical Load Function Tool. [Accessed 01 September 2020]. Available online: http://www.apis.ac.uk

Chartered Institute of Ecology and Environmental Management (CIEEM) (2021). Advisory Note: Ecological Assessment of Air Quality Impacts.

Department of Energy and Climate Change (2011) *Overarching National Policy Statement on Energy EN-1.* Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf.

Department for Environment, Food and Rural Affairs (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.* Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf

Department for Environment, Food and Rural Affairs (2007) The Environment Act 1995 (c. 25). Available online: https://www.legislation.gov.uk/ukpga/1995/25/contents

Department for Environment, Food and Rural Affairs (2016) *Local Air Quality Management Technical Guidance (TG16).* [Accessed 01 September 2020]. Available online: https://laqm.defra.gov.uk/documents/LAQM-TG16-February-18-v1.pdf

Department for Environment, Food & Rural Affairs and Environment Agency (2016) *Air emissions risk assessment for your environmental permit*. [Accessed 01 September 2020]. Available from:

https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits

Department for Environment, Food and Rural Affairs (2020a) *Magic Map Application*.[Accessed 1st September 2020]. Available from: http://www.magic.gov.uk;

Department for Environment, Food and Rural Affairs (2020b) *Background Mapping data for local authorities - 2018*. [Accessed 02 September 2020]. Available from: https://uk-air.defra.gov.uk/data/laqm-background-home

Department for Communities & Local Government (2019) *National Planning Policy Framework*. Available online: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Environment Agency (Air Quality Modelling and Assessment Unit) (2020) *AQMAU. Recommendations for the regulation of impacts to air quality from amine-based post-combustion carbon capture plant.* AQMAU-C2025-WD01 **(DRAFT).**

Environment Agency (2021). Draft BAT Review for New Build and Retrofit Post-Combustion Carbon Dioxide Capture Using Amine-Based Technologies for Power and CHP Plants Fuelled by Gas and Biomass as an Emerging Technology under the IED for the UK, and the associated Summary BAT Guidance.

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

European Commission (2008) *European Directive on Ambient Air Quality* 2008/50/EC.

European Commission (2010), *Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control (Recast))*.

European Commission (2017) *Best available techniques Reference document for Large Combustion Plants.* [Accessed 04 September 2020]. Available online: https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/JRC_107769_LCPBref_2017.pdf

H.M. Government (2010) The Air Quality Standards Regulations (SI 1995 No. 1001). London: The Stationary Office. Available online: https://www.legislation.gov.uk/uksi/2010/1001/contents/made

H.M. Government (2016) The Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154). London: The Stationary Office. Available online: https://www.legislation.gov.uk/uksi/2016/1154/contents/made

H.M. Government (2017) The Conservation of Habitats and Species Regulations 2017 (SI 2017 No. 1012). London: The Stationary Office. Available online: https://www.legislation.gov.uk/uksi/2017/1012/contents/made

Highways England (2019) *Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1, LA 105 Air Quality.* Available online: https://www.standardsforhighways.co.uk/dmrb/search/10191621-07df-44a3-892e-c1d5c7a28d90

Institute of Air Quality Management (2014) *Guidance on the assessment of dust from demolition and construction v1.1,* Update June 2016. Available online: https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

Institute of Air Quality Management (2016) *Guidance on the assessment of mineral dust impacts for planning.* Available online: https://www.the-ies.org/sites/default/files/reports/mineralsguidance_2016.pdf

Institute of Air Quality Management (2017) *Land-Use Planning & Development Control: Planning for Air Quality. v1.2.* Available online: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

Ministry of Housing, Communities & Local Government (2018) *National Planning Practice Guidance*. Available online: https://www.gov.uk/government/collections/planning-practice-guidance

NIPH report (2009) *Health effects of different amines and possible degradation products relevant for CO2 capture* (Eds Låg M, Andreassen Å, Instanes C, Lindemann B) FHI rapport 2009:3.

North Lincolnshire Council (2003), *North Lincolnshire Local Plan.* [Accessed on 26 May 2020]. Available online: https://www.northlincs.gov.uk/planning-and-environment/planning-policy/north-lincolnshire-local-plan/#1537781826371-1ea163f4-477b

North Lincolnshire Council (2011), *Core Strategy*. [Accessed on 26 May 2020]. Available online: https://www.northlincs.gov.uk/planning-and-environment/planning-policy/core-strategy/#1536933016534-8a4c0772-2b2b

Planning Inspectorate (2020) *Scoping Opinion: Proposed Keadby 3 Low Carbon Gas Power State Development, Case Ref: EN010114,* June 2020