RWE

Tween Bridge Solar Farm

Environmental Statement
Chapter 14 : Air Quality & Greenhouse Gases

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

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14. Air Quality and Greenhouse Gases

14.1. Introduction

14.1.1. This chapter of the Environmental Statement (ES) assesses the likely significant effects of the Scheme on air quality and greenhouse gases (GHGs). The assessment has been carried out by Air Quality Consultants Limited (AQC).

14.1.2. Consultation responses received to date from Doncaster Council and North Lincolnshire Council, as well as the Scoping Opinion issued by the Planning Inspectorate on 13 March 2023 (seen at **ES Appendix 1.1 Planning Inspectorate's EIA Scoping Opinion [APP-057]**), and from the statutory and non-statutory consultation on the Preliminary Environmental Information Report (PEIR) have been taken into account during the preparation of this Chapter and this is discussed in detail below.

14.1.3. The operational period of the Scheme will be 40 years; air quality and GHG emissions associated with the decommissioning phase have been scoped out of the assessment (discussed later in **Table 14-7**). This approach is adopted as emissions from any sources in 2069 (40 years from the proposed first year of operation) are expected to be net zero, in line with UK Government targets as set out in policies and legislation discussed in **Section 14.3.**

14.1.4. The Scheme has the potential to affect air quality via the following processes:

- Emissions from plant and equipment during the construction and operational phases;
- Emissions from road traffic during the construction and operational phases; and
- Dust emissions during the construction phase.

14.1.5. The pollutants of concern for human health from construction equipment and road traffic are nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$). As a result of onsite works and activities (e.g. ground disturbance, movement of vehicles over unpaved ground) during the construction phase, there is also the potential for impacts to occur from dust soiling and elevated PM_{10} emissions.

14.1.6. The air quality assessment set out in this chapter focuses on the likely significant effects on human health[1]. The potential for air quality impacts on designated ecological habitats, including both road traffic and construction equipment, is assessed in **ES Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115]**.

14.1.7. The Scheme has the potential to directly, and indirectly, affect climate change through the release of GHGs from a number of sources. The key GHG emitted during the construction and operation of the Scheme will be carbon dioxide (CO_2), however, the assessment includes quantification of GHG emissions that will be released as carbon dioxide equivalent (CO_2e)[2], which includes the contribution of all other GHGs (i.e. gases with a Global Warming Potential (GWP)). The assessment considers GHG emissions:

- Embodied in the materials and components used in the construction of the Scheme (e.g. the manufacture of PV modules and frames);
- From construction site activities (e.g. fuel use by site machinery, electricity consumed by site offices and waste from welfare facilities);
- From road traffic movements during the construction and operational phases;
- From importation (shipping) of PV modules and other components from overseas; and
- From repair and maintenance throughout the lifetime of the Scheme (for example, associated with the replacement of PV modules and Battery Energy Storage System (BESS) components).

14.1.8. This chapter is supported by the following figures:

- **Figure 14.1 Locations of nearest Air Quality Management Areas [APP-169]**;
- **Figure 14.2 Air quality monitoring locations and the Scheme [APP-170]**;

[1] The potential for effects from construction dust on designated ecological sites is also considered in this current report.

[2] CO_2e is the term used for describing different greenhouse gases in a common unit. For any greenhouse gas, CO_2e is the amount of CO_2 that would have the equivalent global warming effect.

- **Figure 14.3 20m and 50m distance bands around construction area [APP-171]**; and
- **Figure 14.4 20m and 50m distance bands around roads used by construction traffic within 250m of the exits for each construction compound [APP-172]**.

14.1.9. This chapter is supported by the following appendices:

- **Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115]**;
- **Appendix 14.2 Environmental Protection UK (EPUK) and The Institute for Air Quality Management (IAQM) Planning for Air Quality Guidance [APP-116]**;
- **Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**;
- **Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**; and
- **Appendix 14.5 Construction Mitigation [APP-119]**.

14.2. Consultation

14.2.1. A summary of consultation responses received from the Scoping Opinion is provided in **Table 14-1**, whilst the corresponding responses from the non-statutory consultation are set out in **Table 14-2**. The consultation responses relate only to the air quality assessment as no consultation responses in relation to the GHG assessment were received for the PEIR.

14.2.2. **Table 14-3** sets out the statutory consultation responses from Natural England received on the PEIR. No comments specifically pertaining to air quality or GHG emissions were provided by either North Lincolnshire Council or Doncaster City Council.

Table 14-1 Summary of consultation – Scoping Opinion

CONSULTEE	SUMMARY OF CONSULTEE RESPONSE	HOW RESPONSE HAS BEEN ADDRESSED BY APPLICANT
Doncaster Council Senior Pollution Control Officer	Air quality issues are principally covered in Section 12 of the [Scoping] report, and I note the references to standard methodology, information from recognised sources, existing concentrations and appropriate receptors etc. That being the case I have nothing further to request for the EIA other than the Council is keeping a close eye on the nitrogen dioxide concentration at King Street in Thorne and therefore would request that vehicles associated with the proposal are not routed through Thorne Town	The assessment has followed the same methodology set out in Section 12 of the Scoping Report. This methodology is provided in **Section 14.3**. Construction traffic will be routed to avoid the centre of Thorne town; this is set out in the **Outline Construction Traffic Management Plan (CTMP) [Document Reference 7.7 Revision 2]** submitted alongside the ES, and which will be secured by DCO requirement.
North Lincolnshire Council Environmental Protection Team Leader	The proposed assessment of air quality impacts during construction is acceptable in principle. This department would request a Construction Environmental Management Plan (CEMP) is submitted with any subsequent planning application.	The assessment has followed the same methodology set out in Section 12 of the Scoping Report. This methodology is provided in **Section 14.3**. An **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3]** has been submitted as part of the DCO application which incorporates

	It is anticipated that operational traffic movements will be minimal, with low numbers of movements expected to be associated with the maintenance of the site. This department would expect the number of vehicle movements to be included within any future ES to ensure this can be screened out.	measures to minimise dust emissions. The number of operational vehicle movements are set out in **Section 14.5** and compared to the relevant screening criteria published by Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) in their Planning for Air Quality guidance. The comparison with the published screening criteria confirms that the impacts can be screened out of the ES.

Table 14-2 Summary of consultation – Non-Statutory Consultation

CONSULTEE	SUMMARY OF CONSULTEE RESPONSE	HOW RESPONSE HAS BEEN ADDRESSED BY APPLICANT
Doncaster Council Senior Pollution Control Officer	The Officer commented that as long as traffic movements through Thorne town centre have been addressed, there would be no issues with the air quality assessment.	Construction traffic will be routed to avoid Thorne town centre; this is set out in the **Outline Construction Traffic Management Plan [Document Reference 7.7 Revision 2]** which will be secured by DCO requirement.
Doncaster Council Head of Sustainability	No comments received to date.	The Applicant notes no comments have been received.

North Lincolnshire Council Environmental Protection Team Leader	Colleagues in Planning will be sending out the consultation to our Team in the near future, if I have any questions during this time I will contact you. In relation to Climate Change, we do not have a specialist within the Council.	The Applicant notes no further comments or queries have been received.

Table 14-3 Summary of consultation – Statutory Consultation

CONSULTEE	SUMMARY OF CONSULTEE RESPONSE	HOW RESPONSE HAS BEEN ADDRESSED BY APPLICANT
Natural England	1.1.2. Air quality Natural England advises that construction phase dust impacts on designated sites should be assessed in the HRA. The draft eCMP states "*Dust arising during construction work is generally considered to only have a significant ecological impact within 20m*" However, we advise that dust produced during the construction phase could cause smothering effects if the designated site is within 200m. The HRA appropriate assessment should therefore assess whether dust-suppression measures outlined in the eCMP provide	This chapter considers the impacts from construction dust on designated sites within 200m of the Order Limits. The efficacy of the mitigation set out in **ES Appendix 14.5 Construction Mitigation [APP-119]** and incorporated into the **Outline Ecological Construction Management Plan [Document Reference 7. 5 Revision 3]** will be provided as part of the Report to Inform **Habitats Regulations Assessment** [**Document Reference 5.3 Revision 4**].

	adequate mitigation for impacts to designated sites within 200m of the works, and would result in no significant change from the baseline.	
	1.1.2. Air quality We note paragraph 14.5.6 states that non-road mobile machinery (NRMM) is unlikely to have an impact on local air quality, however we advise that where NRMM are located in proximity to designated sites there is potential for impacts to sensitive habitats. An assessment should be undertaken which considers the impacts of NRMM on designated sites. Alternatively, precautionary mitigation could be applied by securing a separation distance of 200m between NRMM and designated sites within the CMP or other relevant document. However, it is not currently stated which machinery types are included within the report's definition of NRMM. We advise that if back-up generators are part of the NRMM fleet then a 200m separation distance will not be sufficient to avoid impacts	Further consideration of NRMM impacts in relation to the designated habitats is provided in **ES Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115]**, since some of the main construction compounds and access tracks are within 200m of the Thorne Moor Special Area of Conservation, Special Protection Area and Site of Special Scientific Interest**.** Whilst power for the construction compounds (such as site offices and welfare facilities) will principally be generated from solar PV modules, there will be back-up diesel generators. Further consideration is thus provided in **ES Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115].** Nonetheless, the siting of the construction compounds will be reviewed upon approval, and distances maximised where possible.

	on designated sites and an assessment which includes information on the location, number, capacity, and operational hours of proposed back-up generators should be undertaken.	
	1.1.2. Air quality With regards to air quality impacts from traffic, we note that 14.1.6 states "The routes between the primary compounds and the smaller parcels will be available for the ES, however, it is anticipated that these will be over 200m from the boundary of the designated site" and 14.1.8 states "A small portion of the Draft Order Limits (~4.5 hectares) to the south adjacent to Moor Lane is within 200m of the SAC and SSSI; however, it is unlikely that the internal access tracks will be built in this area, although this will be confirmed in the ES. On this basis, no further assessment is required." We welcome that this will be confirmed in the ES, and advise that impacts from air pollution from traffic can be ruled out if all access tracks and other roads are confirmed to be over 200m from the boundary of the designated	Based on the indicative construction layout presented in **ES Figure 2.1 Indicative Construction Layout Plan [APP-133]**, some short segments of access track are within 200m of the designated habitats. As such, further consideration of the air quality impacts is provided in **ES Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115].** A judgement of significance relating to the effect of construction traffic on the habitats is provided in **ES Chapter 7 Ecology and Nature Conservation [Document Reference 6.2.7 Revision 3].**

	sites. If it is determined that the access routes will be within 200m of designated sites then an assessment of potential air quality impacts should be undertaken in the HRA. The assessment should be undertaken in line with Natural England's guidance NEA001.	
	2.0 Crowle Borrow Pits SSSI Natural England highlights that the revised draft Order Limits are within 100m of Crowle Borrow Pits SSSI, which is designated for a number of swamp, fen and woodland features. Therefore, an assessment of potential impacts to Crowle Borrow Pits SSSI should be provided in the ES, including (but not necessarily limited to) air quality, water quality, water supply and habitat damage.	The Order Limits have been revised further, such that Crowle Borrow Pits Site of Special Scientific Interest is no longer within 100 m, and is now approximately 1 km from the Order Limits. At such distances, consideration of dust impacts is not required (in line with Natural England's response 1.1.2, which states "*we advise that dust produced during the construction phase could cause smothering effects if the designated site is within 200m*"). Further, construction traffic will not utilise the A18 which is within 200 m of the designation. On this basis, further consideration on Crowle Borrow Pits Site of Special Scientific Interest is not required.
	Section 3.2.3 – Peat soils Given that the proposed development is located on mapped areas of peat, it would be expected for the	Further consideration of the volume of peatland within the Order Limits that will be disturbed as part of the construction phase, and the

	potential impact of the development on peat to be included in the assessment, including the potential impact on the carbon within the peat as per the IEMA (2022) guidance. Natural England welcome the provision of information provided with regards to peat soils (highlighted in Chapter 9 - Ground Conditions and Chapter 14 - Air Quality and Greenhouse Gases). We look forward to a more detailed assessment provided in the ES including '*Volume of peat to be disturbed, and subsequently the effect on carbon sequestration, as a result of the Scheme*' as set out in Chapter 14.	subsequent sequestration effects are included in paragraph 14.4.16.

14.3. Assessment Approach

Methodology

General Approach

14.3.1. The Order Limits comprise five solar generation works areas (Land Parcels A to E). For the purposes of this chapter of the ES, it has been assumed that construction could occur across all areas within the Land Parcels, to ensure that the assessment has been carried out on a worst-case approach.

14.3.2. For the purposes of this chapter, management plans (such as the **Outline Construction Environmental Management Plan [Document Reference 7.1 Revision 3]** and **Outline Construction Traffic Management Plan [Document Reference 7.2 Revision 2]**), and the control measures within each plan, are considered as 'embedded mitigation'. This approach is adopted, rather than treating the plans as 'additional mitigation' as described in **ES Chapter 4 Approach to Environmental Impact Assessment [APP-041]**, as the measures

are intrinsic to the overall determination of effects. Notwithstanding, the management plans would be secured by DCO requirement.

Air Quality

Assessment Criteria

14.3.3. The Government has established a set of air quality standards and objectives to protect human health. The 'standards' are based on assessment of the effects of each pollutant on human health, including the effects on sensitive sub-groups. The 'objectives' set out the extent to which the Government expects the standards to be achieved taking account of practical considerations. The objectives for use by local authorities are prescribed within the Air Quality (England) Regulations **[Ref. 14-1]** and the Air Quality (England) (Amendment) Regulations **[Ref. 14-2]** and provided in **Table 14-4**.

Table 14-4 Air quality criteria for nitrogen dioxide, PM_{10} and $PM_{2.5}$

POLLUTANT	TIME PERIOD	VALUE
Nitrogen Dioxide	1-hour Mean	200µg/m^3 not to be exceeded more than 18 times a year
	Annual Mean	40µg/m^3
PM_{10}	24-hour Mean	50µg/m^3 not to be exceeded more than 35 times a year
	Annual Mean	40µg/m^3
$PM_{2.5}$	Annual Mean	20µg/m^3 [a]

[a] There is no numerical $PM_{2.5}$ objective for local authorities (see paragraph 14.3.6). Convention is to assess against the UK limit value which is currently 20µg/m^3.

14.3.4. The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. The Department for Environment, Food and Rural Affairs (Defra) explains where these objectives will apply in its Local Air Quality Management (LAQM) Technical Guidance **[Ref. 14-3]**. The annual mean objectives are considered to apply at the facades of residential properties, schools, hospitals

etc.; they do not apply at hotels. The 24-hour mean objective for PM_{10} is considered to apply at the same locations as the annual mean objectives, as well as in gardens of residential properties and at hotels. The 1-hour mean objective for nitrogen dioxide applies wherever members of the public might regularly spend one hour or more, including outdoor eating locations and pavements of busy shopping streets.

14.3.5. The UK-wide objectives for nitrogen dioxide and PM_{10} should have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. Measurements across the UK have shown that the 1-hour mean nitrogen dioxide objective is unlikely to be exceeded at roadside locations where the annual mean concentration is below 60µg/m^3 **[Ref. 14-3]**. Measurements have also shown that the 24-hour mean PM_{10} objective could be exceeded at roadside locations where the annual mean concentration is above 32µg/m^3.

14.3.6. For $PM_{2.5}$, the objective set by Defra for local authorities is to work toward reducing concentrations without setting any specific numerical value. In the absence of a numerical objective, it is convention to assess local air quality impacts against the limit value (see paragraph 14.3.11), originally set at 25µg/m^3 and currently set at 20µg/m^3.

14.3.7. Defra has also set two targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One target focuses on absolute concentrations, with the long-term target to achieve an annual mean $PM_{2.5}$ concentration of 10µg/m^3 by the end of 2040 (referred to as the Annual Mean Concentration Target or AMCT). The second target relates to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels (referred to as the Population Exposure Reduction Target or PERT). The most recent interim targets published in the 2025 Environmental Improvement Plan aim to meet the AMCT 10 years early, by December 2030, with the interim PERT being a reduction of 30% by December 2030. The $PM_{2.5}$ targets are provided in **Table 14-5**.

Table 14-5 Environment Act $PM_{2.5}$ targets

METRIC	TARGET	TARGET YEAR
AMCT	Interim target: 10µg/m^3	2030
	Legally binding target: 10µg/m^3	2040
PERT	Interim target: 30% reduction in exposure compared to 2018	2030
	Legally binding target: 35% reduction in exposure compared to 2018	2040

14.3.8. In 2024 Defra published Interim Planning Guidance on the $PM_{2.5}$ targets **[Ref. 14-4]**. This states that:

"The purpose of the targets is to improve air quality by reducing levels of $PM_{2.5}$ across the country, therefore improving public health. While achievement of the targets will be assessed at relevant monitoring sites, the targets apply to ambient (outdoor) air throughout England. Applicants and Local Planning Authorities should therefore consider the impact of developments on air quality in all ambient air, whether a monitor is present or not."

14.3.9. In order to address the new targets, it is not sufficient to assess solely whether a scheme is likely to lead to an exceedance of a legal limit. Instead, developments need to implement appropriate mitigation measures from the design stage, ensuring the minimum amount of pollution is emitted and that exposure is minimised.

14.3.10. Pending publication of the new guidance, Defra advises applicants to provide evidence that they have identified key sources of air pollution within the scheme and taken appropriate action to minimise emissions of $PM_{2.5}$ and its precursors as far as possible. More detailed assessment is expected for development closer to populations and/or having higher emissions. Defra has posed two questions to be used as prompts to support the interim assessment process:

"How has exposure to $PM_{2.5}$ been considered when selecting the development site?; and

What actions and/or mitigations have been considered to reduce $PM_{2.5}$ exposure for development users and nearby receptors (houses, hospitals, schools etc.) and to reduce emissions of $PM_{2.5}$ and its precursors?"

14.3.11. All European legislation referred to in this chapter is written into UK Law and remains in place. European Union (EU) Directive 2008/50/EC **[Ref. 14-5]** on ambient air quality and cleaner air for Europe sets limit values for nitrogen dioxide, PM_{10} and $PM_{2.5}$, and is implemented in UK law through the Air Quality Standard Regulations 2010[3]. The limit values for nitrogen dioxide and PM_{10} are the same numerical concentrations as the UK objectives, but achievement of these values is a national obligation rather than a local one.

14.3.12. In the UK, only monitoring and modelling carried out by the UK Central Government meets the specification required to assess compliance with the limit values. It is understood that the UK Government does not recognise local authority monitoring or local modelling studies when determining the likelihood of the limit values being exceeded unless such studies have been audited and approved by Defra and Department for Transport's (DfT's) Joint Air Quality Unit (JAQU).

Screening Criteria for Road Traffic

14.3.13. EPUK and the IAQM[4] recommend a screening approach **[Ref. 14-6]** to determine whether emissions from road traffic generated by a development have the potential for significant air quality effects.

14.3.14. This approach compares the changes in vehicle flows on local roads that a development will lead to against specified screening criteria. The screening thresholds (described in full in **ES Appendix 14.2 Environmental Protection UK (EPUK) and The Institute for Air Quality Management (IAQM) Planning for Air Quality Guidance [APP-116]**) inside an Air Quality Management Area (AQMA) are a change in flows of more than 25 Heavy Duty Vehicles (HDVs) or 100 Light Duty Vehicles (LDVs)[5] per day; outside of an AQMA the thresholds are 100 HDVs or 500 LDVs. Where these criteria are exceeded, an assessment is required, although the guidance **[Ref. 14-6]** advises that *"the criteria provided are precautionary and should be treated as indicative"*, and *"it may be appropriate to amend them on the basis of professional judgement"*.

[3] As amended through The Air Quality Standards (Amendment) Regulations 2016 and The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020.

[4] The IAQM is the professional body for air quality practitioners in the UK.

[5] Vehicles with a total weight less than 3.5 tonnes, such as cars, vans and minibuses.

Study Area

14.3.15. The study area for the assessment has been identified using professional judgement, focusing on the areas where impacts from the Scheme are anticipated to be greatest.

14.3.16. The construction dust risk assessment considers the potential for impacts within 250m of the Order Limits and within 50m of roads used by construction vehicles within 250m of the Order Limits. In addition, it includes ecological habitats sensitive to fugitive dust within 50m of the Order Limits.

14.3.17. The extent of the road traffic assessment has been determined by the area considered as part of **ES Chapter 12 Transport and Access [Document Reference 6.2.12]**, prepared by Pegasus Group, and principally focusses on the roads used to access or egress the main construction compounds. The road traffic study area also considers the M18 near Bessacar, where Doncaster Council has declared an AQMA.

Existing Conditions

14.3.18. Existing sources of emissions and baseline air quality conditions within the study area have been defined using a number of approaches:

- Information on existing air quality has been obtained by collating the results of monitoring carried out by Doncaster Council **[Ref. 14-7]** and North Lincolnshire Council **[Ref. 14-8]**;
- Background concentrations have been defined using Defra's 2021-based background pollutant maps **[Ref. 14-9]**. These cover the whole of the UK on a 1 x 1km grid; and
- Whether or not there are any exceedances of the annual mean limit value for nitrogen dioxide, PM_{10} and $PM_{2.5}$ in the study area has been identified using Defra's Compliance data **[Ref. 14-10]**.

<u>Greenhouse Gases</u>

Existing baseline

14.3.19. The majority of the area within the Order Limits currently consists of arable land, which will have associated GHG emissions from the use of agricultural machinery; fertilisers; and transportation of goods, as well as hedgerows and scattered trees that act as a carbon sink. There are also portions of the Order

Limits that contain peatland, which has the potential to sequester and store GHGs, and thus act as a carbon sink. The assessment considers the existing baseline, taking into account the net emitter properties of agricultural land, and the carbon sink properties of peatland.

Future baseline

14.3.20. Although the existing land use is one way to consider baseline emissions within a GHG assessment, it is also appropriate to consider the future baseline emissions as an alternative project or scenario. This is in line with the Institute of Sustainability and Environmental Professionals (ISEP, formerly the Institute of Environmental Management and Assessment (IEMA)) guidance **[Ref. 14-11]** recommendations. For GHG assessments in the renewable energy sector, it is common practice to consider the baseline emissions associated with the generation of electricity using alternative means of energy, including fossil fuels and natural gas but also nuclear and other renewable energy sources (solar, wind, hydropower etc). Outside renewables, natural gas remains a major contributor to UK electricity in 2025 at over 25% of total national electricity.

14.3.21. As the Overarching National Policy Statement (NPS) for Energy (EN-1) **[Ref. 14-12]** sets out at paragraph 3.3.61, for the UK to transition its energy supply to net zero by 2050 and decarbonise the national electricity grid, there must be a rapid transition from use of fossil fuelled power stations towards renewable energy generation. Over the past two decades, the UK has seen considerable reductions in grid average carbon intensity which is driven largely by the development of renewable energy projects such as the Scheme, enabling reduced use and eventual shutdown of numerous coal and other fossil fuelled power stations. However, the UK's demand for electricity grows and is predicted to continue to grow substantially. Many more renewable energy projects are therefore required.

14.3.22. With this in mind there are two alternative baseline scenarios considered in the assessment:

- Alternative Baseline 1 assumes that energy from the Scheme will allow the phase out of existing fossil fuel power stations in the UK and the energy generated by the Scheme will therefore displace energy generated by natural gas Combined Cycle Gas Turbine (CCGT) power stations[6]; and

[6] It is assumed that residual CCGT power stations will be retrofitted with CCS to remain operational beyond 2035.

- Alternative Baseline 2 assumes that an alternative technology to the Scheme will be operated (an 'Alternative Baseline'). The focus is on a new natural gas fired power station operating with Carbon Capture and Storage (CCS) technology, although comparison to the carbon intensity of other renewable energy schemes is also provided.

Whole Life Carbon Emissions

14.3.23. Total emissions (i.e. covering the full construction phase and lifetime) have been calculated for the following footprint GHG sources using a range of data sources and methodologies.

Embodied Carbon

14.3.24. The embodied carbon from materials and components used to construct the Scheme has been calculated using a number of tools and resources including the Bath University Inventory of Carbon and Energy v3.0 **[Ref. 14-13]** and published International Environmental Performance Declarations (EPDs).

14.3.25. The assessment of embodied carbon covers "cradle to gate" emissions (i.e. carbon emissions from the extraction of raw materials through to finished components). Further details of the calculation methodology and resources are provided in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**.

Construction Site Activities

14.3.26. Emissions from construction activities have been calculated based on an estimate of the volume and types of machinery used during construction works, and assumptions regarding the hours of operation of construction plant. Further details of the calculation methodology and resources are provided in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**.

Construction Traffic

14.3.27. The number of construction trips to and from the Scheme during the construction period has been based on data provided by the project Transport Consultants, Pegasus Group.

14.3.28. The precise origin/destination of these trips is not known and will vary throughout the construction period; to ensure a robust estimate of the overall

construction transport emissions, the following assumptions relating to average distances have been made:

- Articulated Heavy Goods Vehicles (HGVs) will travel 120km. This distance has been based on the Royal Institution of Chartered Surveyors (RICS) guidance **[Ref. 14-14]**;
- Rigid HGVs will travel 80km. This distance has been based on the RICS guidance **[Ref. 14-14]**;
- Each on-site tractor and trailer movement has been assumed to be 10km on average. These movements are contained within the Order Limits; and
- Vehicles associated with the workforce will travel 20km, which encompasses Doncaster. It is planned that non-local members of the workforce will stay in local accommodation and be transported to the Scheme by minibuses.

14.3.29. GHG emission factors for construction transport were obtained from the Department for Energy Security and Net Zero (DESNZ) publication on GHG Conversion Factors for Company Reporting **[Ref. 14-15].** The GHG emissions factors are applied to the calculated total construction travel distance to estimate the GHG emissions from construction transport. Further details of the volume of construction traffic movements and emissions factors used are available in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**.

Shipping Emissions

14.3.30. GHG emission factors for shipping were obtained from the DESNZ publication on GHG Conversion Factors for Company Reporting **[Ref. 14-15]** which sets out GHG emissions factors for a range of modes of transport for freighting goods, including cargo ships, valid for 2025.

14.3.31. The GHG emissions factors are reported in terms of tonnes of CO_2e per mass of the goods shipped per distance travelled. For the purposes of the assessment, it has been assumed that many of the Scheme components will be imported from China, approximately 10,000 nautical miles (18,520km) away. Further details of the assumptions in relation to number, volume and mass of components and shipping emissions factors are provided in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**.

Operational Transport

14.3.32. GHG factors for operational transport were determined using the DESNZ carbon factors **[Ref. 14-15]**.

14.3.33. The calculation of the operational transport GHG emissions is then carried out by multiplying the carbon factor by the distance travelled. It is assumed that operational visits will be carried out by a Light Goods Vehicle, and that each vehicle will travel approximately 20km, which encompasses Doncaster and the surrounding area. It is estimated that two vehicle movements per month (one vehicle travelling to and from the Scheme) will be generated by the Scheme during operation.

14.3.34. Lifetime emissions from operational transport have been calculated by multiplying the annual emissions by the project lifetime of 40 years. This is conservative as it does not account for decarbonisation of road traffic in this period.

Repair, Maintenance and Refurbishment

14.3.35. CO_2e emissions from the repair and maintenance of the Scheme during its lifetime, which are predominated by embodied carbon in replacement components have been calculated using the same methodology as for construction phase embodied carbon.

14.3.36. Assumptions have been made on the quantity of each key component or material (solar PV modules, frames and mounting structures, BESS, HV infrastructure, cables, concrete/hard standing etc.) that will be replaced over the Scheme's 40-year lifetime or the number of times each item will be replaced. These assumptions have been combined with the embodied carbon for each component calculated for the construction phase to estimate lifetime repair, maintenance and replacement emissions. This essentially assumes no decarbonisation of the supply chain over the lifetime of the Scheme, which is very conservative, but consistent with the assumptions in other Whole Life Carbon Assessments for solar developments.

14.3.37. Further details of the assumptions on replacement of components are provided in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**.

Assumptions

14.3.38. Emissions associated with the construction phase of the Scheme are based on the latest available GHG factors for each item considered. This provides a conservative assessment, as emissions associated with the manufacturing of

construction materials and transport are projected to reduce with time, with construction works anticipated to end in 2032. The total emissions arising from construction are based on a works period lasting up to 54 months.

14.3.39. The transport GHG emissions associated with the operation of the Scheme have been calculated for the opening year (assumed to be 2029 for the first phase of the Scheme), taking account of national projections with regards to vehicle fleet etc. These are then assumed to apply each year for the Scheme's lifetime as a worst-case assumption.

14.3.40. As a worst-case scenario (due to the potential for higher GHG emissions) a range of key products and materials have been assumed to be imported via ship from China via the Suez Canal including solar PV modules, cables, inverters, transformers, and the BESS.

14.3.41. Assumptions have been made in relation to the number and activity of site plant and equipment during construction.

14.3.42. It is assumed that the Scheme will export a total of 1,260,000MWh of renewable electricity when fully operational (from 2032). It is assumed that export will begin in 2029 and increase linearly each year to full capacity from 2032. This means:

- 315,000MWh in 2029;
- 630,000MWh in 2030;
- 945,000MWh in 2031; and
- 1,260,000MWh in 2032.

14.3.43. When calculating the total exported electricity over the lifetime of the Scheme, it has been assumed that the generating capacity of the solar PV modules decreased by 0.45% per annum. This means the export values quoted above are slightly adjusted (down) to account for degradation of PV modules operational from 2029 onwards.

Assessment of Significance

Air Quality

Sensitivity of Receptors

Construction Dust

14.3.44. The IAQM guidance **[Ref. 14-16]** (described in full in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**) followed when carrying out the construction dust assessment requires the number of receptors within certain distance bands (as shown in **Section 14.5**) to be established in order to determine the sensitivity of the surrounding area, rather than focussing on impacts at individual receptors. It is, therefore, not necessary to set out specific receptors for the assessment of impacts during the earthworks and construction works.

14.3.45. Residential properties, hospitals and schools are classified as high sensitivity receptors, whilst places of work and parks are classified as medium sensitivity receptors for the construction dust risk assessment.

Operational Phase

14.3.46. Within this chapter, all receptors where the air quality objectives (as set out in **Table 14-4**) apply are considered to be of high sensitivity. Locations where the objectives do not apply must be considered not to be sensitive, therefore there are no medium or low sensitivity receptors within the context of this assessment.

Magnitude of Impacts

Construction Dust

14.3.47. There are no formal statutory or regulatory assessment criteria for dust. In the absence of formal criteria, the approach developed by the IAQM **[Ref. 14-16]** has been used. This follows a sequence of steps:

- Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required;
- Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation; and
- Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant effects.

14.3.48. **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]** explains the approach to the construction dust risk assessment in more detail.

Operational Phase

14.3.49. Where the emissions generated by the Scheme can be screened out for the assessment based on comparisons with published criteria, the impact can be considered to be negligible.

Significance Criteria

14.3.50. It is important to differentiate between the terms 'impact' and 'effect' with respect to the assessment of air quality. The term 'impact' is used to describe a change in pollutant concentration at a specific location. The term 'effect' is used to describe an environmental response resulting from an impact, or series of impacts. Within this chapter, the air quality assessment has used published guidance and criteria described in the following sections to determine the likely air quality impacts at a number of sensitive locations. The potential significance of effects has then been determined by professional judgement, based on the frequency, duration and magnitude of predicted impacts and their relationship to appropriate air quality objectives.

Construction Dust

14.3.51. Guidance from the IAQM **[Ref. 14-16]** is that, with appropriate mitigation in place, the effects of construction dust will be 'not significant'. This chapter thus focuses on determining the appropriate level of mitigation so as to ensure that effects will normally be 'not significant'.

14.3.52. There are two design layouts considered as part of the ES; one based on a hybrid fixed and tracker panel design (referred to as Option 1, see **ES Figure 2.2b Indicative Operational Layout Plan (Fixed and Tracker Solar Panel) [APP-135]**), and another based on an exclusively fixed panel design (referred to as Option 2, see **ES Figure 2.2a Indicative Operational Layout Plan (Fixed Solar Panel) [APP-134]**); further details are provided in **ES Chapter 2 Scheme Description [APP-039].** There are no material differences to the volume of traffic required to transport the different panel components, whilst construction activities will be broadly similar for both options. On this basis, the judgement of significant effects inherently assesses both layout options.

14.3.53. **ES Chapter 4 Approach to Environmental Impact Assessment [APP-041]** states that the construction of the Scheme will either take place over a single, consecutive approach or through multiple stages involving the development of two land parcels concurrently. It is understood that both approaches will result in construction lasting for up to 54 months in total. The project Transport

Consultants, Pegasus Group, have advised that assuming that the entire Scheme could come forward at the same time will lead to the greatest number of vehicle movements across a year; as such, the assessment is based on this single phase approach, in line with the approach set out in **ES Chapter 12 Transport and Access [APP-049]** to ensure the worst-case impacts and effects are identified. If the proposed approaches are adopted (i.e. either two concurrent parcels or single consecutive approach), it is reasonable to assume that the impacts will be equal to, or less than, those presented in this chapter. The final phasing of the construction process would be finalised post consent with approval of a phasing plan, secured by DCO requirement.

Operational Phase

14.3.54. There is no statutory guidance in the UK on how to assess the significance of operational air quality impacts. The approach developed jointly by EPUK and the IAQM **[Ref. 14-6]** has therefore been used.

14.3.55. The overall significance of the air quality impacts upon human health is determined using professional judgement. Full details of the EPUK/IAQM approach are provided in **ES Appendix 14.2 Environmental Protection UK (EPUK) and The Institute for Air Quality Management (IAQM) Planning for Air Quality Guidance [APP-116]**, whilst the experience of the consultants preparing the chapter is set out in **ES Appendix 1.3 Statement of Competence [APP-059]**.

Greenhouse Gases

14.3.56. As described in paragraph 14.3.52, the assessment of significance for GHGs inherently assesses both potential layouts, since the Applicant has advised there are no material differences to the Scheme capacity, annual energy generation, replacement frequency, panel numbers or transport volumes.

Sensitivity of Receptors

14.3.57. The assessment of GHGs does not include identification of sensitive receptors, as GHG emissions do not directly affect specific locations or receptors but lead to indirect effects by contributing to climate change. Identification of sensitive areas for climate change has been undertaken by the Intergovernmental Panel on Climate Change (IPCC) **[Ref. 14-17]**.

14.3.58. Impacts on specific areas are not included within this assessment, since the impacts of GHG emissions will affect the global atmosphere, and therefore need to be considered in a total context, rather than on localised areas.

Magnitude of Impacts

14.3.59. There are no prescribed impact descriptors for GHG emissions, and as such the assessment follows the approach described in ISEP's (formerly IEMA's) 2022 guidance on assessing GHG emissions and determining their significance **[Ref 14.11]**.

Significance Criteria

14.3.60. The ISEP (formerly IEMA) guidance **[Ref. 14-11]** identifies three underlying principles to inform the assessment of significance, as follows:

- GHG emissions from all projects will contribute to climate change, the largest interrelated cumulative environmental effect;
- The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive – e.g., population, fauna, soil, etc.; and
- GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant.

14.3.61. Based on these principles, ISEP (formerly IEMA) conclude that:

- When evaluating significance, all new GHG emissions contribute to an adverse environmental impact, however, some projects will replace existing development or baseline activity that has a higher GHG profile. The significance of a project's emissions should therefore be based on its net impact over its lifetime, which may be positive, negative or negligible;
- Where GHG emissions cannot be avoided, the goal of the EIA process should be to reduce the project's residual emissions at all stages; and
- Where GHG emissions remain significant, but cannot be further reduced, approaches to compensate the project's remaining emissions should be considered.

14.3.62. In advising on the significance of any net change in GHG emission resulting from a development ISEP (formerly IEMA) identify that in order to limit the adverse effects from climate change global temperature change needs to be limited to well below 2°C, aiming for 1.5°C. The implication of this objective is that global emissions need to fall to net zero by 2050.

14.3.63. The UK's response to limiting climate change is enshrined in law through the Climate Change Act 2008 which requires the UK economy to be net zero by 2050 following a trajectory set through five-yearly carbon budgets. The 2050 target (and interim budgets set to date) are, according to the Committee on Climate Change (CCC), compatible with the required magnitude and rate of GHG emissions reductions required in the UK to meet the goals of the Paris Agreement, thereby limiting severe adverse effects.

14.3.64. It follows, therefore, that the significance of any net change of GHG resulting from a development is not so much whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions consistent with a trajectory towards net zero by 2050.

14.3.65. To establish the significance of the GHG emissions from a development therefore requires judgements on:

- The consistency with policy requirements, since these have been specified to ensure the economy decarbonises in line with the UK's net zero target; and
- The degree to which the development has sought to mitigate its emissions.

14.3.66. Examining each of these dimensions allows the assessment to make professional judgement on the likely significance of effects based on a set of significance criteria established in the ISEP (formerly IEMA) guidance **[Ref. 14-11]**, summarised in **Table 14-6**.

Table 14-6 ISEP (formerly IEMA) GHG significance criteria

SIGNIFICANCE RATING	DESCRIPTION	CRITERIA TO DETERMINE SIGNIFICANCE OF NET GHG EMISSIONS
Major Adverse	A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.	The project's net GHG impacts are: • not mitigated or are only compliant with do-minimum standards set through regulation; and • do not provide further reductions required by

		existing local and national policy for projects of this type.
Moderate Adverse	A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.	The project's net GHG impacts are: • partially mitigated; and • may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type.
Minor Adverse	A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.	The project's net GHG impacts are: • fully consistent with applicable existing and emerging policy requirements; and • in line with good practice design standards for projects of this type.
Negligible	A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.	The project's net GHG impacts are: • reduced through measures that go well beyond existing and emerging policy; and • better than good practice design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050.

Beneficial	A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.	The project's net GHG impacts are: • below zero; and • it causes a reduction in atmospheric GHG concentrations, whether directly or indirectly, compared to the without-project baseline.

14.3.67. The guidance **[Ref. 14-11]** states:

"A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that has a minor adverse effect that is not significant. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78% reduction by 2035 and thereby potentially avoiding significant adverse effects."

"A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory, and has minimal residual emissions, is assessed as having a negligible effect that is not significant. This project is playing a part in achieving the rate of transition required by nationally set policy commitments."

14.3.68. ISEP (formerly IEMA) also advises that:

- Major adverse, moderate adverse and beneficial effects should be considered significant in the context of EIA. Minor adverse and negligible effects are considered to be not significant;
- In the case of large-scale developments, irrespective of the level of mitigation, if net GHG emissions exceed 5% of UK or devolved administrations carbon budget, that this is a level of change that is considered significant;
- Meeting the minimum standards set through existing policy or regulation cannot necessarily be taken as evidence of avoiding a significant adverse effect, and it is recommended therefore that the assessment also considers emerging policy/standards and the guidance of expert bodies

such as the CCC on necessary policy developments, particularly for multi-phased projects with long timescales; and

- To aid decision making it is important to inform the decision maker about the relative severity of environmental effects such that they can be weighed in a planning balance. Therefore, it is essential to provide context for the magnitude of GHG emissions reported in the EIA in a way that aids evaluation of these effects by the decision maker. ISEP (formerly IEMA) advise that context can be provided through comparison of the whole life GHG emissions resulting from the development with national, local and sectoral totals, as well as carbon budgets.

14.3.69. Therefore, the assessment of significance is established over two steps as follows:

Step 1: Establish Context of GHG Emissions

14.3.70. Context for decision making is provided by comparing the net change in the whole life GHG emissions resulting from the Scheme with local and regional GHG emissions totals, and carbon budgets.

Step 2: Determine Significance of Effects

14.3.71. Significance of effects is established through applying the criteria detailed in **Table 14-6** based on professional judgement that considers:

- The consistency of the development with national, regional and local policies designed to limit GHG emissions and meet the UK's net zero target; and

- The robustness, timeliness and efficacy of mitigation measures proposed to avoid, reduce and compensate GHG emissions.

14.3.72. In terms of mitigation, ISEP (formerly IEMA) recommends that mitigation should in the first instance seek to avoid GHG emissions. Where GHG emissions cannot be avoided, the development should aim to reduce the residual significance of a project's emissions at all stages. Where additional GHG emissions remain but cannot be further reduced at source, approaches should be considered that compensate the project's remaining emissions, for example through offsetting (i.e. investing in projects off site which avoid, reduce or remove carbon, for example, reforestation, renewable energy projects or carbon-storing agricultural practices).

Legislative and Policy Framework

Air Quality

Air Quality Strategy 2007 **[Ref. 14-18]**

14.3.73. The Air Quality Strategy, published by Defra and Devolved Administrations, provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the LAQM regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an AQMA and prepare an Air Quality Action Plan (AQAP) which identifies appropriate measures that will be introduced in pursuit of the objectives.

Air Quality Strategy 2023 **[Ref. 14-19]**

14.3.74. The Air Quality Strategy: Framework for Local Authority Delivery 2023 sets out the strategic air quality framework for local authorities and other Air Quality Partners in England. It sets out their powers and responsibilities, and actions the Government expects them to take. It does not replace other air quality guidance documents relevant to local authorities.

Clean Air Strategy 2019 **[Ref. 14-20]**

14.3.75. The Clean Air Strategy sets out a wide range of actions by which the Government will seek to reduce pollutant emissions and improve air quality. Actions are targeted at four main sources of emissions: Transport, Domestic, Farming and Industry. At this stage, there is no straightforward way to take account of the expected future benefits to air quality within this assessment.

Environment Act **[Ref. 14-21]**

14.3.76. The UK's new legal framework for protection of the natural environment, the Environment Act 2021 passed into UK law in November 2021. The Act gives the Government the power to set long-term, legally binding environmental targets. It also establishes an Office for Environmental Protection (OEP), responsible for holding the Government to account and ensuring compliance with these targets.

14.3.77. The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96) sets two new targets for future concentrations of $PM_{2.5}$. These targets are described in paragraph 14.3.7.

Environmental Improvement Plan 2025 **[Ref. 14-22]**

14.3.78. Defra published its 25 Year Environment Plan in 2018 **[Ref. 14-23]**. The Environment Act **[Ref. 14-21]** requires Defra to review this Plan at least every five years. The Environmental Improvement Plan 2025 is the second iteration, building upon the first iteration in 2023. This outlines the progress made since 2018 and adds detail to the goals defined in the 2018 Plan and subsequent Environmental Improvement Plan 2023, including that of achieving clean air.

14.3.79. The Environmental Improvement Plan 2025 sets out updated air quality targets which have been set for concentrations of $PM_{2.5}$. These targets, which are described in paragraph 14.3.7, include the long-term targets in the Statutory Instrument described in paragraph 14.3.77, and revised interim targets to be achieved by 2030.

14.3.80. The 2025 Plan reiterates the role of local authorities in helping it meet both its targets and existing commitments. It also outlines the respective roles of industry, agricultural sectors, and the DfT in providing the coordinated action required to meet both its new, and pre-existing, targets and commitments.

Road To Zero Strategy **[Ref. 14-24]**

14.3.81. The Road to Zero Strategy affirms the Government's pledge to end the sale of new conventional petrol and diesel cars and vans by 2040. It states that the Government expects the majority of new cars and vans sold to be 100% zero tailpipe emission and all new cars and vans to have significant zero tailpipe emission capability by this year, and that by 2050 almost every car and van should have zero tailpipe emissions. The Government's 'Zero Emission Vehicle' (ZEV) mandate requires that 80% of new cars and 70% of new vans sold in Great Britain must be zero exhaust emission by 2030, increasing to 100% by 2035. If these ambitions are realised, then road traffic-related NOx emissions can be expected to reduce significantly over the coming decades.

National Planning Policy

14.3.82. The current NPS for Renewable Energy Infrastructure (EN-3) **[Ref. 14-25]**, together with the Overarching National Policy Statement for Energy (EN-1) **[Ref. 14-12]**, provide a policy basis for decisions regarding nationally significant renewable energy infrastructure projects. There is no specific NPS for solar

projects; although the NPS for Renewable Energy Infrastructure (EN-3) **[Ref. 14-25]** includes a section on the impacts of solar photovoltaic generation, it does not refer to air quality.

14.3.83. In terms of the assessment of air quality impacts, paragraphs 5.2.8 to 5.2.10 in EN-1 state:

"*Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement (ES).*

The ES should describe:

- *existing air quality concentrations and the relative change in air quality from existing levels;*
- *any significant air quality effects, mitigation action taken 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 emissions, concentration change and absolute concentrations as a result of the proposed project, after mitigation methods have been applied…*

In addition, applicants should consider the Environment Targets (Fine Particulate Matter) (England) Regulations 2022 and associated Defra guidance."

14.3.84. In terms of dust emissions, paragraphs 5.7.5 to 5.7.7 state:

"*The applicant should assess the potential for… emissions of… dust… to have a detrimental impact on amenity, as part of the ES.*

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.*

The applicant is advised to consult the relevant local planning authority and, where appropriate, the EA about the scope and methodology of the assessment."

14.3.85. The Overarching NPS for Energy (EN-1) **[Ref. 14-12]** sets out the following additional information and guidance for the assessment:

"Defra publishes future national projections of air quality based on estimates of future levels of emissions, traffic, and vehicle fleet. Projections are updated as the evidence base changes and the applicant should ensure these are current at the point of an application. The applicant's assessment should be consistent with this but may include more detailed modelling and evaluation to demonstrate local and national impacts. If an applicant believes they have robust additional supporting evidence, to the extent they could affect the conclusions of the assessment, they should include this in their representations to the Examining Authority along with the source.

Where a proposed development is likely to lead to a breach of any relevant statutory air quality limits, objectives or targets, or affect the ability of a noncompliant area to achieve compliance within the timescales set out in the most recent relevant air quality plan/strategy at the time of the decision, the applicant should work with the relevant authorities to secure appropriate mitigation measures to ensure that those statutory limits, objectives or targets are not breached.

The Secretary of State should consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application. A construction management plan may help codify mitigation at this stage. In doing so the Secretary of State should have regard to the Air Quality Strategy in England, or the Clean Air Plan for Wales in Wales, or any successors to these and should consider relevant advice within Local Air Quality Management guidance and $PM_{2.5}$ targets guidance."

14.3.86. The National Planning Policy Framework (NPPF) **[Ref. 14-26]** sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which (paragraph 8c) is an environmental objective:

"*to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources*

prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

14.3.87. To prevent unacceptable risks from air pollution, paragraph 187 of the NPPF states that:

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

14.3.88. Paragraph 198 states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".

14.3.89. More specifically, on air quality, paragraph 199 makes clear 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".

14.3.90. The NPPF is supported by Planning Practice Guidance (PPG) **[Ref. 14-27]**, which includes guiding principles on how planning can take account of the impacts of new development on air quality. The PPG states at paragraph 001 that:

"The Department for Environment, Food and Rural Affairs carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with Limit Values. It is important that the potential impact of new

development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified".

14.3.91. Regarding plan-making, the PPG states at paragraph 002:

"It is important to take into account air quality management areas, Clean Air Zones and other areas including sensitive habitats or designated sites of importance for biodiversity where there could be specific requirements or limitations on new development because of air quality".

14.3.92. Regarding the need for an air quality assessment, the PPG states at paragraph 005 that:

"*Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity*".

14.3.93. The PPG sets out the information that may be required in an air quality assessment, making clear at paragraph 007 that:

"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."

14.3.94. The PPG also provides guidance on options for mitigating air quality impacts, as well as examples of the types of measures to be considered. It makes clear at paragraph 008 that:

"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented".

Local Transport Plan

14.3.95. The Sheffield City Region, which covers Doncaster, adopted its Transport Strategy 2018 - 2040 in 2019 **[Ref. 14-28]**. This includes Policy 4, which aims to "*Improve air quality across our City Region to meet legal thresholds, supporting improved health and activity for all, especially in designated AQMAs and CAZs*."

Local Policies

14.3.96. The Doncaster Local Plan 2015 – 2035 **[Ref. 14-29]** was adopted in September 2021 and includes Policy 54, 'Pollution', which states that:

"*Development proposals that are likely to cause pollution, or be exposed to pollution, will only be permitted where it can be demonstrated that pollution can be avoided, or where mitigation measures (such as those incorporated into the design and layout of development) will minimise significantly harmful impacts to acceptable levels that protect health, environmental quality and amenity. When determining planning applications, particular consideration will be given to:*

A) an assessment of the risks to public health and the impact of cumulative effects and where necessary that the provision for mitigation against the total effects has been provided…

…C) the impact on national air quality; especially but not limited to Air Quality Management Areas, areas potentially close to the EU limit value, other sensitive areas and the aims and objectives of the Air Quality Action Plan. An Air Quality Assessment will be required to enable clear decision making on any relevant planning application."

14.3.97. Doncaster Council has also produced an Air Quality Technical Planning Guidance **[Ref. 14-30]** document. This document sets out guidance on air quality requirements for developers, including the required content for air quality assessments.

14.3.98. The North Lincolnshire Core Strategy [**Ref. 14-31]** was adopted in June 2011, and within this, Spatial Objective 7: '*Efficient Use and Management of Resources'*, aims 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.*"

14.3.99. Spatial Objective 7 also states that *"The framework will also support measures to minimise pollution and improve air…quality"*.

National Air Quality Action Plan

14.3.100. Defra has produced an Air Quality Plan to tackle roadside nitrogen dioxide concentrations in the UK **[Ref. 14-32]**; a supplement to the 2017 Plan **[Ref. 14-33]** was published in October 2018 and sets out the steps Government is taking in relation to a further 33 local authorities where shorter-term exceedances of the limit value were identified. Alongside a package of national measures, the 2017 Plan and the 2018 Supplement require those identified English Local Authorities to produce local action plans and/or feasibility studies. These plans and feasibility studies must have regard to measures to achieve the statutory limit values within the shortest possible time, which may include the implementation of a Clean Air Zone (CAZ).

14.3.101. Since the typical outcome of the 2017 Plan and 2018 Supplement is the creation of a CAZ, the effects of which are not yet incorporated into Defra's modelling tools, there is currently no straightforward way for practitioners to take account of the effects in an air quality assessment. However, consideration has been given to whether there is currently, or is likely to be in the future, a limit value exceedance in the vicinity of the Scheme.

14.3.102. This assessment has principally been carried out in relation to the air quality objectives, rather than the limit values that are the focus of the Air Quality Plan.

Doncaster Council Air Quality Action Plan

14.3.103. Doncaster Council has declared eight AQMAs for exceedances of the annual mean nitrogen dioxide objective.

14.3.104. The Council has developed an AQAP which was revised in 2018 **[Ref. 14-34]**. This sets out a range of measures to improve air quality within the borough, aimed at reducing vehicle emissions, reducing traffic volumes, improving public transport, and raising awareness.

14.3.105. The Council is currently consulting on a new AQAP, which comprises 10 measures that are largely focused on transport, including promoting alternatives and low emission transport and building the infrastructure to effect change.

North Lincolnshire Council Air Quality Action Plan

14.3.106. North Lincolnshire Council declared an AQMA for exceedances of the 24-hour mean PM_{10} objective in 2005 as a result of industrial emissions around Scunthorpe, which was amended in 2018. The Council updated its Air Quality Action Plan **[Ref. 14-35]** in 2024; however, this is not relevant to this assessment due to the distance between the Order Limits and the Scunthorpe AQMA (over 10km).

Greenhouse Gases

National Policies

14.3.107. The NPS document EN-1 **[Ref. 14-12]** includes Section 5.3 on the assessment of GHG emissions; paragraph 5.3.4 states:

"All proposals for energy infrastructure projects should include a carbon assessment as part of their ES (See Section 4.2). This should include:

- *A whole life GHG assessment showing construction, operational and decommissioning GHG impacts*
- *An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages*
- *Measurement of embodied GHG impact from the construction stage*
- *How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures*
- *How operational emissions have been reduced as much as possible through the application of best available technology for that type of technology*
- *Calculation of operational energy consumption and associated carbon emissions*
- *Whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework*

Where there are residual emissions, the level of emissions and the impact of those on national and international efforts to limit climate change, both alone and where relevant in combination with other developments at a regional or national level, or sector level, if sectoral targets are developed".

14.3.108. NPS EN-3 on renewable energy infrastructure **[Ref. 14-25]** includes Section 2.10 on solar development, but does not include any specific policy or guidance on GHG emissions.

14.3.109. Part 14 of the NPPF **[Ref. 14-26]** is titled *"Meeting the challenge of climate change, flooding and coastal change"* and sets out the strategy for minimising the climate change effects of new development. Paragraph 164 states that:

"New development should be planned for in ways that […] can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards."

14.3.110. Paragraph 165 states further that:

"*To help increase the use and supply of renewable and low carbon energy and heat, plans should:*

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers."

14.3.111. Paragraph 168 states that, when determining planning applications for renewable and low carbon development, planning authorities should:

"a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal's contribution to a net zero future;

b) recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions; and

c) in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable."

Climate Change Act 2008 **[Ref. 14-36]**

14.3.112. The overarching Act in relation to climate is the Climate Change Act 2008. The Act introduces a legally binding target to reduce the UK's GHG emissions to at least 80% below 1990 levels by 2050. It also provides for a CCC with power to set out carbon budgets binding on the Government for five-year periods.

14.3.113. In the 2009 budget, the first three carbon budgets were announced which set out a binding 34% CO_2e[7] reduction by 2020; and the Government has since adopted the fourth and fifth carbon budgets to reduce CO_2e by 50% by 2025 and 57% by 2030.

14.3.114. The CCC also produces annual reports to monitor the progress in meeting these carbon budgets. Consequent upon the enactment of the Climate Change Act, a raft of policy at national and local level has been developed aimed at reducing carbon emissions.

Climate Change Act 2008 (2050 Target Amendment) Order 2019 **[Ref. 14-37]**

14.3.115. In June 2019, the Government passed an order to amend the 2050 carbon emissions target in the Climate Change Act 2008 from 80% below 1990 levels to zero net carbon (i.e. 100% below 1990 levels). This new target will essentially end the UK's contribution to climate change by 2050.

Carbon Budget Order 2021 **[Ref. 14-38]**

14.3.116. The Carbon Budget Order 2021 came into force in June 2021. It sets a legal obligation to meet the targets of the Climate Change Act 2008 and subsequent amendment to cut GHG emissions by 78% by 2035.

Energy Act (2023) **[Ref. 14-39]**

14.3.117. Enacted in October 2023, the Energy Act makes provision about energy production and security and the regulation of the energy market, including new

[7] Carbon dioxide equivalent (CO_2e) is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.

frameworks to incentivise investment in clean energy technologies, such as low-carbon heat schemes. It also makes provision about energy smart appliances and load control, the energy performance of premises and energy savings opportunity schemes, amongst other measures to ensure clean and affordable energy for the UK.

Net Zero Strategy **[Ref. 14-40]**

14.3.118. The UK Government's Net Zero Strategy sets out the strategy for achieving the UK's binding commitment to net zero carbon emissions by 2050.

14.3.119. The strategy sets out a number of key aims and objectives to decarbonise the UK economy across all sectors. In relation to the power sector the strategy includes commitments to take action so that all of the UK's electricity supply comes from low carbon sources by 2035 and to accelerate the development of renewable energy generation such as wind and solar.

Decarbonising Transport **[Ref. 14-41]**

14.3.120. The DfT published the Decarbonising Transport plan in 2021, setting out how transport emissions reductions will be delivered in order to reach net zero by 2050. This includes phasing out the sale of all non-zero tailpipe emission vehicles by 2040; for HGVs, sales of all new medium sized vehicles are to be zero tailpipe emission from 2035, with the largest vehicles being zero tailpipe emission by 2040.

Energy White Paper **[Ref. 14-42]**

14.3.121. The Government's energy white paper sets out the plan for growth and decarbonisation of the UK's energy supply out to 2050, in line with the 2050 net zero target. The white paper provides a framework of policies and incentives to accelerate investment in renewable energy infrastructure and acknowledges that "*onshore wind and solar will be key building blocks of the future generation mix"* [8].

Local Policies

14.3.122. Doncaster Council's Local Plan **[Ref. 14-29]** contains Strategic Policy 58: Low Carbon and Renewable Energy which states:

[8] See Page 45 of the Energy White Paper.

"The Council aims to increase the supply of low carbon and renewable energy generated in the Borough, in accordance with the principles set out below:

A) Proposals will be supported which give priority to:

1. community energy schemes that are in full or part community ownership;

2. biomass and energy crop schemes especially to the north and south east of the main urban area, for example mixed woodland, single species short rotation forestry and large-scale forestry, outside of areas of high quality arable farmland;

3. heat or power generation from light, water, waste and other low carbon heat sources;

4. landfill and sewage gas energy generation schemes;

5. wind power projects which meet the criteria of Policy 59; and

6. micro-renewable energy technologies and decentralised heat and power systems within new development.

B) In all cases, low carbon and renewable energy proposals will be supported where they:

1. have undertaken community engagement and demonstrate how they will deliver environmental, social and economic benefits;

2. have no unacceptable adverse effects on local amenity and air quality, and include appropriate stand-off distances between technologies and sensitive receptors, such as residential areas;

3. allow the continued safe and efficient operation of Doncaster Sheffield Airport;

4. would have no unacceptable adverse effects on highway safety and infrastructure;

5. have no unacceptable adverse impacts, including cumulative impacts, on the built and natural environment (including landscape character, and historic and nature conservation assets, such as Thorne and Hatfield Moors); and

6. reclaim the site to a suitable and safe condition and use (such as agriculture or nature conservation) within a defined and agreed period should the development cease to be operational."

14.3.123. The North Lincolnshire Core Strategy **[Ref. 14-31]** contains Policy CS18: Sustainable Resource Use and Climate Change which states:

"*The council will actively promote development that utilises natural resources as efficiently and sustainably as possible. This will include:*

…4. Meeting required national reductions of predicted CO_2 emissions by at least 34% in 2020 and 80% in 2050 by applying the following measures on development proposals. Requiring all industrial and commercial premises greater than 1,000 square metres to provide 20% of their expected energy demand from on site renewable energy until the code for such buildings is applied nationally. Where developers consider these Codes and targets cannot be met on the basis of viability they will be required to provide proof through open book discussions with the council at the planning application stage.

…6. Supporting development that minimises the consumption and extraction of minerals by making the greatest possible reuse or recycling of materials in new construction, and by making best use of existing buildings and infrastructure.

…10. Ensuring development and land use helps to protect people and the environment from unsafe, unhealthy and polluted environments, by protecting and improving the quality of the air, land and water.

11. Supporting renewable sources of energy in appropriate locations, where possible, and ensuring that development maximises the use of combined heat and power, particularly at the South Humber Bank employment site and where energy demands for more than 2MW are required for development.

12. Supporting new technology and development for carbon capture and the best available clean and efficient energy technology, particularly in relation to the heavy industrial users in North Lincolnshire, to help reduce CO_2 emissions."

Scoping Criteria

14.3.124. The following air quality and greenhouse gas comments were provided in the Planning Inspectorate Scoping Opinion dated 13 March 2023.

Table 14-7 Extract of air quality and greenhouse gas based scoping table from Scoping Opinion for the Scheme

ID	REF	MATTER	PLANNING INSPECTORATE COMMENTS	APPLICANT'S RESPONSE
3.13.1	Paras 12.47 and 12.52	Road traffic and GHG emissions - decommissioning	The Scoping Report proposes to scope out an assessment of air quality impacts related to the decommissioning of the Proposed Development on the basis that road traffic and GHG emissions at the time of decommissioning are expected to be zero. The Inspectorate agrees that these matters can be scoped out.	Impacts relating to the decommissioning phase have been scoped out, as set out in paragraph 14.1.3.
3.13.2	Paras 12.50 and 12.67	Road traffic and GHG emissions - operation	The Scoping Report proposes to scope out these matters on the basis that traffic movements during operation are expected to be minimal. The Inspectorate agrees that these	To ensure a robust consideration of the whole lifecycle associated with the Scheme, the CO_2e emissions arising from road traffic during operation have been included within the GHG

			matters can be scoped out.	assessment, as set out in paragraphs 14.3.32 to 14.3.34. This approach has been taken since although the operational road traffic emissions are a small component of the total footprint, as the information is available, the calculated operational road traffic CO_2e emissions have been included as part of the whole lifecycle footprint.
3.13.3	Para 12.66	Detailed assessment of construction traffic impacts on ecological sites	On the basis that the Decision Making Thresholds set out by the Joint Nature Conservation Committee are not exceeded and that the roads affected by the Proposed Development are more than 200m from any designated site, the Inspectorate agrees that a detailed	Further discussion, including the traffic volumes generated by the Scheme close to the designated habitats, is provided in **ES Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115]**.

			assessment of construction traffic impacts on ecological sites can be scoped out.	
3.13.4	Para 12.57	Impacts from dust	Paragraph 12.57 of the Scoping Report refers to ecological sites within 50m of the site boundary being assessed. The impacts from dust (not limited to construction traffic) on ecological sites within 200m of the construction area should be assessed.	As set out in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, the IAQM guidance on the assessment of dust from demolition and construction **[Ref. 14-16]** states that: *"An assessment will normally be required where there is:* *an 'ecological receptor' within:* *- 50m of the boundary of the site; or* *- 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s)."* As set out in paragraph 14.5.32

				in **Section 14.5**, the project ecologist has advised on the sensitivity of ecological sites to dust within 200m of the Order Limits.
3.13.5	n/a	Air Quality Management Areas (AQMAs)	Details regarding the locations of any AQMAs relative to the site are not included in the Scoping Report. The ES should provide information to explain the locations of any AQMAs relative to the Proposed Development and assess (where relevant) any potential impacts the Proposed Development may have on them, for example due to construction traffic, and describe any mitigation measures.	The locations of the nearest AQMAs are set out in **ES Figure 14.1 Locations of nearest Air Quality Management Areas [APP-169].** Based on the proposed routing of construction vehicles, and the distances from the Order Limits it is judged that there is no need to propose mitigation measures currently within the AQMAs.

Limitations to the Assessment

14.3.125. The following assumptions and limitations are relevant to the assessment:

- The Scheme first begins electricity export in 2029, and is complete and operating at full capacity in 2032;
- Construction of the Scheme will take place over a period of up to 54 months;
- All materials used in construction are new, with no reuse or repurposing of materials (as a worst-case assumption);
- The **Outline CEMP [Document Reference 7.1 Revision 3]** and **Outline CTMP [Document Reference 7.7 Revision 2]** will be in place for the duration of the construction period; and
- The operational period of the Scheme is 40 years.

14.4. Baseline Conditions

Site Description and Context

14.4.1. The majority of the Order Limits is currently used as agricultural land, with portions of the Order Limits containing peatland. At its closest points, the Order Limits is approximately 12km to the northeast of Doncaster, and 10km west of Scunthorpe. The M180 and A18 pass through the Order Limits, as does the Stainforth and Keadby Canal.

14.4.2. There are several isolated residential properties in proximity to the Scheme, whilst the towns of Thorne and Crowle are both within 1km of the Order Limits.

Baseline Survey Information

Air Quality

Air Quality Management Areas

14.4.3. Doncaster Council has declared eight AQMAs for exceedances of the annual mean nitrogen dioxide objective, the nearest of which, covering a section of the M18 near Bessacarr, is over 10km from the western boundary of the Order Limits.

14.4.4. North Lincolnshire Council has declared a single AQMA for exceedances of the 24-hour mean PM_{10} objective as a result of industrial emissions. The AQMA covers part of the town of Scunthorpe and an area to the east which covers the steelworks, and which is approximately 12km from the eastern boundary of the Order Limits.

14.4.5. The locations of the AQMAs relative to the Order Limits are shown in **ES Figure 14.1 Locations of nearest Air Quality Management Areas [APP-169].**

Local Nitrogen Dioxide Monitoring

14.4.6. Doncaster Council monitored air quality throughout its area in 2023[9] using five automatic monitoring stations, none of which are within 10km of the Scheme. The Council also measures concentrations of nitrogen dioxide at a number of locations using diffusion tubes. North Lincolnshire Council also monitors air quality in its administrative area; however, the majority of its monitoring locations are in Scunthorpe, 10km from the Scheme.

14.4.7. The locations of monitors within 10km of the Scheme are shown in **ES Figure 14.2 Air quality monitoring locations and the Scheme [APP-170]**. **Table 14-8** shows the diffusion tube monitoring data for the years 2019 to 2023; data for Doncaster have been taken from Doncaster Council's 2024 Air Quality Annual Status Report (ASR) **[Ref. 14-7]**, whilst data for North Lincolnshire have been taken from North Lincolnshire Council's 2024 Air Quality ASR **[Ref. 14-8]**.

14.4.8. The results presented in **Table 14-8** show no exceedances of the annual mean objective were measured within 10km of the Scheme. Furthermore, concentrations were well below 60µg/m^3 at all monitoring sites, indicating an exceedance of the 1-hour mean objective is unlikely across the study area **[Ref. 14-3]**. Between 2019 and 2023 there has been a gradual reduction in concentrations across both local authorities such that concentrations at most sites in 2023 are below concentrations at the peak of the Covid-19 pandemic and lockdowns in 2020 and 2021; the exception is DT32 in Blaxton, where concentrations increased.

Table 14-8 Summary of annual mean nitrogen dioxide monitoring (µg/m^3)

SITE ID	SITE TYPE	LOCATION	2019	2020	2021	2022	2023
Doncaster							
DT30	Roadside	Gate House Lane, Auckley	16.0	13.6	14.2	14.3	12.4
DT31	Roadside	B1396 Mosham Road, Blaxton	14.1	11.6	11.2	13.1	10.5

[9] The latest year of available data at the time of writing the chapter.

DT32	Roadside	A614 Station Road, Blaxton	15.4	13.0	19.2	21.3	20.4
DT33	Rural	Hatfield Moors, off A614 Thorne Road	8.7	7.9	7.2	9.3	6.3
DT34	Roadside	A614 Bawtry Road, Hatfield Woodhouse	18.5	14.4	13.7	16.3	13.1
DT35	Rural	Hatfield Moors, Hollinbridge Lane	9.9	-	8.3	10.4	8.1
DT38	Urban Background	Church Road, Stainforth	15.6	13.8	14.1	13.5	12.1
DT50	Roadside	A614 King Street, Thorne	38.0	28.5	30.4	30.6	27.9
North Lincolnshire							
2	Roadside	Scotter Road	24.0	21.5	24.6	24.3	23.5
3	Roadside	B&Q	18.0	17.5	17.2	19.8	16.5
4	Roadside	Hilton Avenue	20.0	19.0	21.0	20.7	18.6
24	Roadside	Burringham Road / Woodside Drive	-	-	17.3	15.9	14.3
OBJECTIVE			**40**				

Local Particulate Matter Monitoring

14.4.9. Doncaster Council measures PM_{10} and $PM_{2.5}$ concentrations at four automatic monitors within its area, whilst North Lincolnshire monitors PM_{10} at all six of its automatic monitors and concentrations of $PM_{2.5}$ at two of the monitors.

14.4.10. Although the monitors are all located more than 10km from the Order Limits, there have been no exceedances of either the PM_{10} or $PM_{2.5}$ annual mean

objectives at any monitor across Doncaster or North Lincolnshire in recent years **[Ref. 14-7] [Ref. 14-8]**, whilst concentrations of $PM_{2.5}$ also met the AMCT at both monitor locations in Doncaster. An exceedance of the 24-hour mean PM_{10} objective was recorded in 2022 at one of the monitors located in an industrial setting in Scunthorpe.

14.4.11. Concentrations of PM_{10} and $PM_{2.5}$ in 2023 in North Lincolnshire have reduced compared to 2019, whilst in Doncaster none of the automatic monitors have measured five consecutive years of data since 2019 to conclude any trends in concentrations.

Exceedances of the Limit Values

14.4.12. Defra's Compliance data **[Ref. 14-10]** do not identify any exceedances of the annual mean or 1-hour mean objectives across either Doncaster or North Lincolnshire. As such, there is considered to be no risk of a limit value exceedance in the vicinity of the Scheme by the time that it is operational.

14.4.13. As discussed in paragraph 14.3.100, Defra has produced an Air Quality Plan **[Ref. 14-32]** to tackle roadside nitrogen dioxide concentrations in the UK. Within this Plan, whilst North Lincolnshire is not identified, Doncaster Council is identified as having limit value exceedances in or beyond 2017, but not beyond 2020, thus the Plan does not require the authority to undertake any further action. A High Court judgement **[Ref. 14-43]** declared the Plan unlawful with regard to its application to the 45 local authority areas in which exceedances were projected beyond 2017, but not beyond 2020. The judgement required the 33 local authorities where exceedances were projected beyond 2018 to *"develop and implement a plan designed to deliver compliance in the shortest time possible"*; Doncaster Council is not one of these authorities, having no projected exceedances beyond 2018, thus it was not required to produce a plan.

Background Concentrations

14.4.14. Estimated background concentrations in the study area are set out in **Table 14-9** and are all well below the objectives. A range of values is presented as the Order Limits cover multiple 1 x 1km grid squares.

Table 14-9 Estimated annual mean background pollutant concentrations in 2023 (µg/m³)

YEAR	NO_2	PM_{10}	$PM_{2.5}$

2023	5.8 – 8.0	11.3 – 16.3	5.7 – 6.5
OBJECTIVE / AMCT[a]	**40**	**40**	**20 [b] / 10 [a]**

[a] To be met by 2040.

[b] The 20 µg/m^3 $PM_{2.5}$ objective is not in Regulations and there is no requirement for local authorities to meet it.

Greenhouse Gases

Existing Use Baseline

14.4.15. A report by Natural England on UK carbon sequestration **[Ref. 14-44]** provides estimated average net GHG emissions from land used for arable agriculture as described in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**. Based on an approximate total Order Limits area of 1,831 hectares, the existing land uses would result in baseline GHG emissions of approximately 21,240TCO_2 over the 40-year lifetime of the Scheme.

14.4.16. There are, however, areas within the Order Limits that contain peatland, which has the potential to sequester and store GHGs, and thus it acts as a carbon sink, leading to a reduction in the existing baseline emissions associated with the Scheme in its current use. The majority of peat soils within the Order Limits are subject to cultivation and disturbance from agricultural activities on the land. As described in **ES Chapter 9 Ground Conditions [APP-046]**, these soils are degraded and wasted at shallow depths and as such are not likely to be actively sequestering carbon. Given disturbance during construction will only occur at shallow depths (not dissimilar to cultivation), it is considered that minimal disturbance of peat soils will occur and carbon emissions will not be materially different to the current agricultural use of the land.

14.4.17. Overall, baseline GHG emissions associated with existing use of the Order Limits land for agriculture, including peat soils are very small.

Alternative Baseline 1 – Replacement of CCGT Power

14.4.18. In relation to Alternative Baseline 1 as described in paragraph 14.3.22 it is assumed that the electricity generated by the Scheme would, in the absence of the Scheme, be generated using an unabated natural gas-fired CCGT power station to 2035, and from then until 2069 the CCGT power station would have a CCS system installed (see paragraph 4.9.25 of NPS EN-1 **[Ref. 14-15]**). It has been assumed that this CCS system would reduce direct GHG emissions by

90%; this percentage reduction is considered appropriate based on publications on typical large scale carbon capture efficacy. This approach has been adopted as it is part of the UK's industrial decarbonisation strategy to use CCS technology, which may apply to fossil-fuel power stations.

14.4.19. The operational emissions from unabated natural gas fired CCGT power stations are assumed to be 375gCO_2e/kWh, which is taken from the Government's 2023/2024 fuel mix disclosure data **[Ref. 14-45]**[10]. From 2035, this is assumed to reduce to 37.5gCO_2e/kWh to account for CCS.

14.4.20. For Alternative Baseline 1 it is assumed that 315GWh (gigawatt hours) of electricity will be generated in 2029, 630GWh in 2030, 945GWh in 2031 and 1,260GWh from 2032 (in line with paragraph 14.3.42) and that the electricity generated reduces by 0.45% per annum due to panel degradation.

14.4.21. Lifetime GHG emissions from Alternative Baseline 1 (CCGT) are 3,706,131 tonnes of CO_2e.

Alternative Baseline 2 – Alternative Technologies

14.4.22. In relation to Alternative Baseline 2 as described in paragraph 14.3.22, **Table 14-10** presents the lifecycle emissions from other forms of energy generation considered in this assessment **[Ref. 14-46]**. The data are shown as emissions intensity (gCO_2e per kWh of energy generated), and as total lifecycle emissions (TCO_2e) based on the Scheme's lifetime electricity export of 48,234GWh.

Table 14-10 Lifecycle GHG Emissions from Various Forms of Energy Generation (gCO_2e/kWh) [Ref. 14-46]

ENERGY SOURCE	ENERGY GENERATION FORM	LOWER THRESHOLD LIFECYCLE GHG EMISSIONS gCO_2e/kWh (TCO_2e)	UPPER THRESHOLD LIFECYCLE GHG EMISSIONS gCO_2e/kWh (TCO_2e)
	Natural Gas Combined Cycle	403 (19,438,173)	513 (24,743,877)

[10] 2024/2025 data will not be published until August 2025.

Fossil Fuel – Natural Gas	(NGCC) plant without CCS		
	NGCC with CCS	92 (4,437,498)	221 (10,659,643)
Hydropower	Hydropower (360 MW)	6.1 (294,225)	11 (530,570)
	Hydropower (660 MW)	85 (4,099,863)	147 (7,090,351)
Nuclear	Average Nuclear Power Station	5.1 (245,992)	6.4 (308,696)
Solar PV	Poly-silicon, ground mounted	23 (1,109,375)	82 (3,95,5162)
	Cadmium telluride (CdTe), ground mounted	8 (385,869)	28 (1,350,543)
	Copper Indium Gallium Selenide (CIGS), ground mounted	7.4 (356,929)	27 (1,302,309)
Wind	Onshore	7.8 (376,223)	16 (771,739)
	Offshore, concrete foundation	13 (627,038)	23 (1,109,375)
	Offshore, steel foundation	12 (578,804)	21 (1,012,907)

14.5. Assessment of Likely Significant Effects

Air Quality

14.5.1. Whilst there are two layout options presented in **ES Chapter 2 Scheme Description [APP-039],** as described in paragraph 14.3.52, there are no material differences to construction activities or traffic volumes. As such, it is considered that the outcomes of the assessment remain valid regardless of which option is taken forward.

Construction

Construction Traffic

14.5.2. The construction of the Scheme will generate a maximum Annual Average Daily Traffic (AADT) flow of 89 two-way movements on any road, of which 42 will be HDV movements.

14.5.3. This total trip generation (42 HDVs and 48 LDVs) is well below the screening criteria of 100 HDVs and 500 LDVs set out in the EPUK/IAQM guidance **[Ref. 14-6]**.

14.5.4. There will be up to 31 primary construction compounds used during the construction phase which will be accessed from the public highway from several locations. Vehicles will access and egress the southern areas of the scheme[11] via the A18, Low Levels Bank and an unnamed road parallel to the A18[12]; parcels of land to the north of the Stainforth and Keadby Canal[12] will be accessed via Marsh Road (Crowle) and Coulman Street / Moor Edges Road[13], thus avoiding the centre of Thorne. Full details are available in the **Outline Construction Traffic Management Plan (CTMP) [Document Reference 7.7 Revision 2].** Vehicles will distribute in both directions on the strategic road network, including the M180 and M18, such that no more than 50 HDVs will use any single road.

14.5.5. As set out in paragraph 14.4.3, Doncaster Council has declared an AQMA along a section of the M18 to the south of the Scheme; however, it is understood that HDVs will likely travel via Goole or Immingham ports, which are located to the north of the Scheme, and will not therefore pass through the AQMA. With respect to LDVs, if the entire workforce is based in Doncaster, then the number of LDV trips (48 movements) is still below the screening criteria in the AQMA **[Ref. 14-6]**, however this is judged unlikely, since in reality, workers will be based across Doncaster, North Lincolnshire or the East Riding of Yorkshire[13], such that the trips are unlikely to exclusively originate from the south. Notwithstanding, monitoring of nitrogen dioxide carried out by Doncaster Council within this AQMA has been well below the annual mean objective since monitoring commenced in 2020, with concentrations of 14.1µg/m^3 (Site DT68) and 15.1µg/m^3 (Site DT69) recorded in 2023 **[Ref. 14-7].** The screening thresholds discussed in paragraph 14.3.14 were developed to cover all possible eventualities, and are, therefore, focused on more worst-case environments and where exceedances

[11] See **ES Figure 2.2 Indicative Operational Plan [APP 134/ APP135]** for the locations of each land parcel.
[12] As set out in **ES Chapter 2 Scheme Description [APP-039]** and the **Outline Construction Traffic Management Plan [Document Reference 7.7 Revision 2]**.
[13] As set out in **ES Chapter 11 Socio Economics [APP-048].**

of the objectives are likely or possible. Taking account of the concentrations measured in the AQMA, the traffic screening criteria are therefore judged to be conservative, and thus even if construction traffic flows exceeded the criteria, it is unlikely that there would be an adverse impact.

14.5.6. Based on the traffic generation, the impacts from construction traffic on local air quality will be **negligible (not significant)** and occur for a transient period of time. It is, therefore, reasonable to conclude that the overall effect on local air quality will be 'not significant'.

On-Site Exhaust Emissions

14.5.7. The IAQM guidance **[Ref. 14-16]** states:

"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) 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".

14.5.8. The Order Limits cover approximately 1,831 hectares, the majority of which is more than 50m from any sensitive human health receptors; consideration of the effect of on-site plant on designated habitats is provided in **ES Appendix 14.1 Air Quality Impacts on Designated Ecological Sites [APP-115].** Further, the main construction compounds (as shown in **ES Figure 2.1 Indicative Construction Layout Plan [APP-133]**) are over 50m from sensitive receptors, the exceptions being a small number (<5) of isolated properties adjacent to the A18 and Green Bank.

14.5.9. As such, whilst the exact siting and numbers of NRMM to be used onsite during the construction phase is unknown, the distance between any areas of operation and sensitive receptors will be maximised, as far as possible. Further, all vehicles and plant will be switched off when not in use; this is specified as part of the **Outline CEMP [Document Reference 7.1 Revision 3]**.

14.5.10. It is judged that there is no risk of significant effects at existing human health receptors as a result of on-site machinery emissions.

Construction Dust and Particulate Matter Emissions

14.5.11. The construction works will give rise to a risk of dust impacts during earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway.

14.5.12. Step 1 of the assessment procedure is to screen the need for a detailed assessment. There are receptors within the distances set out in the guidance (see **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**), thus a detailed assessment is required. The following section sets out Step 2 of the assessment procedure.

Potential Dust Emission Magnitude

Demolition

14.5.13. The Order Limits are used for agricultural land, thus there will be no demolition on site.

Earthworks

14.5.14. The characteristics of the soil at the Order Limits have been defined using the British Geological Survey's UK Soil Observatory website **[Ref. 14-47]**, as set out in **Table 14-11**. Overall, it is considered that, when dry, this soil has the potential to be moderately dusty.

Table 14-11 Summary of soil characteristics

CATEGORY	RECORD
Soil Layer Thickness	Deep
Soil Parent Material Grain Size	Mixed (Primarily Argillaceous [a] to Arenaceous [b] and Peat)
European Soil Bureau Description	Mixed (Primarily Riverine Clay and Floodplain Sands and Gravel, Eolian Sand, Peat, Glaciolacustrine and Eolian Sand)
Soil Group	Mixed (Primarily Light (Sandy), Light (Silty), Medium and Heavy)
Soil Texture	Mixed (Clay to Clayey Loam[c] to Silty Loam, Sand and Peat)

[a] grain size < 0.06 mm.

[b] grain size 0.06 – 2.0 mm.

[c] a loam is composed mostly of sand and silt.

14.5.15. The Order Limits covers approximately 1,831 hectares and most of this will be subject to at least some form of earthworks, including the excavation of trenches for cabling, directional drilling and ground preparation for the 132kV Substations and RWE on-site 400kV Substation and BESS compounds. Dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials (such as dry soil).

14.5.16. Based on the example definitions set out in **Table 14.4.1** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, the dust emission class for earthworks is considered to be *large*.

Construction

14.5.17. The Scheme requires the construction of the RWE on-site 400kV Substation and the installation of the solar PV modules along with the erection of a perimeter fence. In addition, smaller temporary construction compounds will be located across the Order Limits as the Scheme is constructed. Dust will arise from vehicles travelling over unpaved ground, the handling of soil during the installation of the electric cabling, the handling of concrete and stone chippings for the substations and piling to support the solar panel frames.

14.5.18. Based on the example definitions set out in **Table 14.4.1** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, the dust emission class for construction is considered to be *large*.

Trackout

14.5.19. As an annual average, there will be no more than 50 HDVs leaving the Scheme; these trips will, however, be distributed across the egress points from the construction compounds to the public highway. The Applicant has advised that during peak construction, there could be as many as 57 HDVs leaving any Land Parcel (Parcel A for up to four months).

14.5.20. Based on the example definitions set out in **Table 14.4.1** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, the dust emission class for trackout is considered to be *large*.

14.5.21. **Table 14-12** summarises the dust emission magnitude for the Scheme.

Table 14-12 Summary of dust emission magnitude

SOURCE	DUST EMISSION MAGNITUDE
Demolition	None
Earthworks	Large
Construction	Large
Trackout	Large

Sensitivity of the Area

14.5.22. This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the Order Limits. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

14.5.23. The IAQM guidance **[Ref. 14-16]** explains that residential properties are 'high' sensitivity receptors to dust soiling (**Table 14.4.2** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**). Residential properties are also classified as being of 'high' sensitivity to human health effects. The

majority of the area within 100m of the Order Limits is agricultural land, however, there are approximately 75 - 80 residential properties within 20m of the Order Limits (see **ES Figure 14.3 20m and 50m distance bands around construction area [APP-171]**), and over 100 within 50m. These are largely located next Land Parcels A, B and D.

14.5.24. **Table 14-12** shows that the dust emission magnitude for trackout is *Large*, and **Table 14.4.3** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]** thus explains that there is a risk of material being tracked 250m from the five construction compounds.

14.5.25. There are approximately 45 residential dwellings within 20m of the routes used by vehicles exiting the Scheme, the majority of which are adjacent to the egress point for Land Parcel B, whilst there are additional properties within 50m of the egress points for Land Parcels A and B, and The Lincolnshire Golf Course is adjacent to the exit point for Land Parcel E (see **ES Figure 14.4 20m and 50m distance bands around roads used by construction traffic within 250m of the exits for each construction compound [APP-172]**).

Sensitivity of the Area to Effects from Dust Soiling

14.5.26. Using the information set out in paragraph 14.5.23 and **ES Figure 14.3 20m and 50m distance bands around construction area [APP-171]**, alongside the matrix set out in **Table 14.4.3** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, the area surrounding the onsite works is of 'high' sensitivity to dust soiling.

14.5.27. Using the information set out in paragraph 14.5.25 and **ES Figure 14.4 20m and 50m distance bands around roads used by construction traffic within 250m of the exits for each construction compound [APP-172]** alongside the same matrix, the area is of 'high' sensitivity to dust soiling due to trackout.

Sensitivity of the Area to any Human Health Effects

14.5.28. The matrix in **Table 14.4.4** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]** requires information on the baseline annual mean PM_{10} concentration in the area. With the exception of one monitor downwind of an asphalt plant, PM_{10} concentrations measured across Doncaster and North Lincolnshire over the last five years have been below 24µg/m^3 (the threshold concentration in **Table 14.4.4** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**).

14.5.29. Using the information set out in paragraph 14.5.23 and **ES Figure 14.3 20m and 50m distance bands around construction area [APP-171]**, alongside the matrix set out in **Table 14.4.4** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, the area surrounding the onsite works is of 'low' sensitivity to human health effects.

14.5.30. Using the information set out in paragraph 14.5.25 and **ES Figure 14.4 20m and 50m distance bands around roads used by construction traffic within 250m of the exits for each construction compound [APP-172]** alongside the same matrix, the area surrounding roads along which material may be tracked from the site is also of 'low' sensitivity.

Sensitivity of the Area to any Ecological Effects

14.5.31. The guidance considers designated ecological sites within 50m to have the potential to be impacted by the construction works. Thorne Moor Special Area of Conservation (SAC), Thorne, Crowle and Goole Moors Site of Special Scientific Interest (SSSI) and Hatfield Chase Ditches SSSI are all within 20m of the Order Limits; Hatfield Moors SAC and SSSI is within 100m of the southern Order Limits.

14.5.32. The guidance considers SACs and SSSIs with dust-sensitive features to be of 'high' and 'medium' sensitivity, respectively; Tyler Grange, the Project Ecologists confirmed that the designated habitats (for example, moorland, bogs and heathland) may be affected by dust soiling, whilst species such as invertebrates and nightjars could also be sensitive to dust.

14.5.33. **Table 14.4.5** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]** shows that the areas around the construction works are of 'high' sensitivity to ecological effects. Only Hatfield Chase Ditches SSSI is within 20m of the route used by construction vehicles exiting compound 5, therefore the area surrounding roads along which material may be tracked from the site is of 'medium' sensitivity. There would be no change to this conclusion if the 200m distance buffer, as set out in the Planning Inspectorate's Scoping Opinion in **Table 14-7** (Comment ID 3.13.4) was applied.

Summary of the Area Sensitivity

14.5.34. **Table 14-13** summarises the sensitivity of the area around the proposed construction works.

Table 14-13 Summary of the area sensitivity

EFFECTS ASSOCIATED WITH:	SENSITIVITY OF THE SURROUNDING AREA	
	ON-SITE WORKS	TRACKOUT
Dust Soiling	High	High
Human Health	Low	Low
Ecological	High	Medium

Risk and Significance

14.5.35. The dust emission magnitudes in **Table 14-12** have been combined with the sensitivities of the area in **Table 14-13** using the matrix in **Table 14.4.6** in **ES Appendix 14.4 Construction Dust Assessment Procedure [APP-118]**, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in **Table 14-14**. These risk categories have been used to determine the appropriate level of mitigation as set out in **Section 14.6** (Step 3 of the assessment procedure).

Table 14-14 Summary of risk of impacts without mitigation

SOURCE	DUST SOILING	HUMAN HEALTH	ECOLOGY
Demolition	None	None	None
Earthworks	High Risk	Low Risk	High Risk
Construction	High Risk	Low Risk	High Risk
Trackout	High Risk	Low Risk	Medium Risk

14.5.36. The IAQM guidance does not provide a method for assessing the significance of effects before mitigation and advises that pre-mitigation significance should not be determined.

14.5.37. It should, however, be noted that whilst the risk of dust soiling has been identified as 'High', this is largely driven by the large area covered by the Order Limits. In reality, activities will only occur in discreet areas, with the multiple

stage construction approach developing no more than two parcels concurrently, such that the risk is likely to be lower in actuality. However, by adopting the approach that the whole area within the Order Limits is worked, it ensures that the mitigation recommended in **ES Appendix 14.5 Construction Mitigation [APP-119]** is robust to minimise any emissions.

Operation

14.5.38. During operation, activities onsite would amount to servicing and maintenance of plant and equipment associated with the Scheme, which will result in approximately one visit to the Scheme per month[12]; it is likely that the vehicles would be either a 4x4 or 7.5tonne van. This trip generation (<1 per day) is well below the screening criteria of 500 LDVs and 100 HDVs set out in the EPUK/IAQM guidance **[Ref. 14-6]**.

14.5.39. Based on the traffic generation, the impacts from operational traffic on local air quality will be **negligible**. It is, therefore, reasonable to conclude that the overall effect will be **'not significant'**.

Achieving Compliance with the $PM_{2.5}$ Targets

14.5.40. The monitoring data described in **Section 14.4** demonstrate that annual mean $PM_{2.5}$ concentrations are currently below the AMCT, which is to be met by 2040, at both monitors in Doncaster.

14.5.41. Defra have set out in their Interim Planning Guidance **[Ref. 14-4]** two questions designed to consider whether a development supports the AMCT and PERT $PM_{2.5}$ targets. The first question is *"How has exposure to $PM_{2.5}$ been considered when selecting the development site?"*, whilst the second question is *"What actions and/or mitigations have been considered to reduce $PM_{2.5}$ exposure for development users and nearby receptors (houses, hospitals, schools etc.) and to reduce emissions of $PM_{2.5}$ and its precursors?"*.

14.5.42. Whilst the Scheme itself is not classed as relevant exposure, as explained later in **Section 14.7**, ways to minimise $PM_{2.5}$ emissions have been considered in the following ways:

- Emissions during the construction phase will be managed through the use of appropriate mitigation measures and set out within an **Outline CEMP [Document Reference 7.1 Revision 3]** and **Outline CTMP [Document Reference 7.7 Revision 2]** secured by DCO requirement;

- A Delivery Management System will be in place to coordinate and control deliveries, and vehicles will not be allowed to idle on the public highway;
- Construction vehicles will be diverted away from populated areas (such as Thorne), thus minimising the population exposed to vehicle emissions;
- The planting and landscaping strategy will include new hedgerow planting, hedgerow trees, blocks of woodland planting and small copses to act as a buffer between the Scheme and sensitive receptors;
- During construction, contractors will be housed in accommodation close to the Scheme, so that vehicle miles are reduced;
- Contractors will be transported to the Site using minibuses, to minimise the number of private vehicles accessing the site;
- Construction traffic movements through Crowle will be managed and timed to avoid the peak hours on the highway network and the busiest times of the school day to reduce exposure to vehicle emissions;
- The Scheme includes two Electric Vehicle charging points, which will be available to the community; and
- Once operational, the Scheme will provide energy to meet the needs of over 240,000 homes, thus facilitating a transition away from combustion sources.

14.5.43. It is considered that the development complies with the requirements to deliver achievement of the AMCT and PERT by 2040 as appropriate action has been taken to minimise emissions of $PM_{2.5}$ and its precursors as far as is reasonably practicable.

Greenhouse Gases

14.5.44. Whilst there are two layout options presented in **ES Chapter 2 Scheme Description [APP-039],** as described in paragraph 14.3.56, there are no material differences to capacity, energy generation, traffic volumes or panel replacement rate. As such, it is considered that the lifetime GHG emissions will not be materially different regardless of which option is taken forward.

Embodied Carbon

14.5.45. As described in paragraph 14.3.24, the embodied GHGs in construction materials and components have been calculated using a range of resources (see **ES**

Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]). A summary of the embodied carbon emissions is provided in **Table 14-15**.

Table 14-15 Embodied carbon emissions

SCHEME COMPONENT	EMBODIED CARBON (TCO_2E)	% OF EMBODIED CARBON
Solar PV Modules	359,092	60.2%
PV Framework	26,708	4.5%
Cables	62,283	10.4%
HV Infrastructure (Inverters, Transformers, Switchgear)	31,260	5.2%
BESS (Batteries, Containers, HVAC)	73,598	12.3%
Substations	37,714	6.3%
Concrete/hard standing	5,801	1.0%
TOTAL	**596,457**	**100%**

14.5.46. The total CO_2e emissions associated with the embodied carbon in construction materials and components is 596,457 tonnes.

Construction Site Activities

14.5.47. As described in paragraph 14.3.26, emissions associated with construction site activities can be estimated based on assumptions about the plant and machinery operating on site during the works as set out in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2].**

14.5.48. The total CO_2e emissions associated with construction site activities is 17,086tonnes.

Construction Transport

14.5.49. The calculation of construction transport related GHG emissions for the Scheme have been calculated for construction site staff, materials transport by road and shipping separately as shown in **Table 14-16**.

Table 14-16 Construction transport emissions

CONSTRUCTION TRANSPORT CATEGORY	CARBON EMISSIONS (TCO_2e)
Materials Transport – Road	10,498
Materials Transport – Shipping	36,999
Construction Staff Travel	859
TOTAL	**48,356**

14.5.50. The total CO_2e emissions from construction transport for the Scheme is 48,356tonnes.

Operational Traffic

14.5.51. The calculation of operational transport related GHG emissions for the Scheme multiplies the calculated GHG emission factors for an average Light Goods Vehicle by the average distance travelled. Total vehicle numbers were provided by the Project Transport Consultant, Pegasus.

14.5.52. The total operational transport GHG emissions are calculated as $3TCO_2e$ over the 40-year lifetime of the Scheme.

Repair, Maintenance and Refurbishment

14.5.53. GHG emissions relating to the repair, maintenance and refurbishment of the Scheme over its lifetime are calculated to be 122,221 tonnes. The largest contributions to these emissions are BESS (assuming three replacements in 40 years). Further details are provided in **ES Appendix 14.3 GHG Footprint Methodology [Document Reference 6.3.14.3 Revision 2]**.

Total GHG Emissions Footprint

14.5.54. **Table 14-17** summarises the GHG emissions for the Scheme in the lifetime for each footprint element.

14.5.55. As shown in **Table 14-17**, the Scheme will result in total GHG emissions over its lifetime of 784,112 tonnes CO_2e.

Table 14-17 Lifetime GHG footprint for the Scheme

PHASE	FOOTPRINT ELEMENT	TONNES OF CO_2e EMISSIONS	% OF LIFETIME EMISSIONS
Construction	Embodied Carbon	596,457	76.1%
	Site Activities	17,076	2.2%
	Transport	48,356	6.2%
	Construction Total	**661,889**	**84.4%**
Operation	Transport	3	<0.1%
	Repair, Maintenance and Refurbishment	122,221	15.6%
	Operation Total	**122,221**	**15.6%**
TOTAL	-	**784,112**	**100%**

Carbon Intensity and Energy Offset

Alternative Baseline 1 – Replacement of CCGT Power

14.5.56. The Scheme will provide renewable electricity that would otherwise be generated via alternative means with higher carbon intensity, such as CCGT which utilises the burning of natural gas. Specifically, the Scheme is supportive of government policy to transition the national grid to renewables, enabling the

removal of fossil fuel generated fuel electricity (e.g., natural gas) from the grid. Alternative Baseline 1 therefore compares the lifecycle carbon emissions of the Scheme to that of a natural gas-fired power generation using CCGT, with CCS assumed to be installed in the future. In this scenario the baseline emissions are 3,706,131TCO_2e, (see paragraph 14.4.21) which is more than four times the Scheme's lifecycle emissions of 784,112TCO_2e. This represents a carbon emissions saving of -2,922,019TCO_2e. It should be noted this value excludes indirect emissions from the operation of the CCGT power station including construction of the CCS and fuel supply chain emissions which would further increase the potential carbon emissions avoided.

14.5.57. The 'payback' period - i.e. the period when direct CCGT emissions would exceed the lifecycle emissions of the Scheme would be less than two years (assuming a CCGT does not have CCS fitted until 2035).

14.5.58. Overall, it is demonstrated that the Scheme will lead to avoided GHG emissions by replacing electricity currently generated by more carbon intensive methods (such as natural gas CCGT), and enable the removal of fossil fuel generation from the UK electricity grid.

Alternative Baseline 2 – Alternative Technologies

14.5.59. The Scheme has the potential to generate approximately 1,260,000MWh of electricity each year. Over the lifetime of the Scheme this is estimated to equate to 48,233,679MWh which assumes a 0.45% annual degradation rate in energy production. Based on a lifetime GHG footprint of 784,112TCO_2e, this equates to a carbon intensity factor of 0.016kgCO_2e per kWh.

14.5.60. Utilising the carbon intensity values presented in **Table 14-10** for other forms of energy generation (including fossil fuel, nuclear and renewable energy sources), the carbon intensity of the electricity generated by the Scheme and lifecycle GHG emissions from the Scheme are below the lower end of the range for that generated from the poly-silicon, ground mounted solar energy sources and is therefore indicative of good practice for a ground-mounted solar PV system. It also falls considerably below the carbon intensity values for electricity generated by fossil fuel power stations, even when taking account of CCS.

14.5.61. Whilst the carbon intensity of electricity generated by the Scheme is higher than the benchmark data for nuclear or onshore wind, it should be noted that NPS EN-1 emphasises that to ensure reliable electricity systems during the transition to net zero 2050, the UK must adopt a diverse mix of renewable energy sources (including solar projects) to come forward in conjunction with one another.

Establish Context

14.5.62. The first step of the assessment of significance is to establish the context of GHG emissions from the Scheme, through comparison to the UK's carbon budgets (as required by EN-1).

14.5.63. The UK has legislated a 2050 net zero target following recommendations and analysis completed by the CCC. To meet this target, the CCC sets carbon budgets to establish carbon emissions limits. The construction emissions (occurring between 2028 and 2032) coincide with the UK's 5th carbon budget, which covers the periods 2028-2032. The operational emissions of the Scheme (occurring from 2029 onwards) coincide with the UK's 5th and 6th carbon budgets, which cover the periods 2028-2032 and 2033-2037, respectively. The CCC has recently published a recommended 7th carbon budget for the period 2038-2042 and whilst this has not been formally adopted yet and there are no official carbon budgets available for the period 2042 onwards, representative budgets have been projected forward to 2050 based on the 7th carbon budget recommendation.

14.5.64. **Table 14-18** summarises both the gross and net changes in GHG emissions from the Scheme, taking account of both the construction and operational phases, of as a percentage of the UK's 5th, 6th, 7th, 8th and 9th carbon budgets. The net emissions take into account CCGT with CCS technology from 2035 to demonstrate the savings in CO_2e emissions within the budget periods spanning from 2028 to 2050.

Table 14-18 Lifetime GHG footprint for the Scheme

UK Budget	Period	Budget Value ($MTCO_2e$)	Gross GHG Emissions due to the Proposed Development ($MTCO_2e$)	% of UK Carbon Budget	Net GHG Emissions due to the Proposed Development ($MTCO_2e$)	% of UK Carbon Budget
5th Carbon Budget	2028 - 2032	1,725	0.677	0.039%	-0.498	-0.029%

6th Carbon Budget	2033 – 2037	965	0.015	0.002%	-1.057	-0.110%
7th Carbon Budget	2038 – 2042	535	0.015	0.003%	-0.216	-0.040%
8th Carbon Budget	2043-2047	302	0.015	0.005%	-0.215	-0.071%
9th Carbon Budget	2048-2050	169	0.009	0.005%	-0.128	-0.076%

14.5.65. **Table 14-18** shows that the gross GHG emissions as a percentage of carbon budgets are no greater than 0.04% and therefore very small. Much of the embodied GHG emissions (which make up the majority of construction emissions and emissions from operational replacement parts) will be emitted abroad during product manufacture and is therefore not included within the UK's carbon budgets. Embodied carbon emissions in the supply chain are also likely to decarbonise during the operational lifetime of the Scheme, but this is not captured in the modelling. As such, the comparison is conservative.

14.5.66. While the Scheme will result in operational residual emissions, it will enable substantial emissions reductions relative to the electricity generation from CCGT with or without CCS technology. The reductions will contribute up to 0.11% reduction in UK carbon budgets (vs the 6th carbon budget).

Consistency with Policy

14.5.67. The second step in determining the likely significant effects is to demonstrate the Scheme's consistency with national and local policy, which is described in the following sections.

National Policies

14.5.68. In terms of national policy, the key national policies are contained within the NPS and NPPF.

NPS

14.5.69. Section 5.3 of EN-1 outlines the requirements for the GHG assessment; the assessment has demonstrated that the Scheme is consistent with the requirements in the following ways:

- A whole life GHG assessment has been completed which includes the emissions associated with each stage of the Scheme and components associated with each stage (such as embodied carbon during construction); since the decommissioning phase will take place after 2050, emissions associated with the decommissioning have been scoped out (as agreed with PINS – see **Table 14-7**);
- Mitigation, secured by design and through DCO requirement, have been identified to minimise the overall impacts of the Scheme; and
- The assessment has demonstrated that the Scheme will generate energy with a lower carbon intensity factor than fossil fuels, thus, the transition to energy generated by the Scheme will result in a net reduction in carbon emissions.

14.5.70. There are no relevant sections within EN-3.

NPPF

14.5.71. Paragraphs 164 b), 165 and 168 are of particular relevance to the GHG assessment, which are all within Part 14 of the NPPF.

14.5.72. Paragraph 164 b) requires that: "*New development should be planned in ways that can help reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.*"

14.5.73. The Scheme will provide an alternative electricity supply to fossil fuels and non-zero emission sources; in this respect, it will directly reduce GHG emissions. The Scheme therefore complies with paragraph 164 b) of the NPPF.

14.5.74. Paragraph 165 requires that: "*To help increase the use and supply of renewable and low carbon energy and heat, plans should: a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts); b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting*

infrastructure, where this would help secure their development; and c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for colocating potential heat customers and suppliers."

14.5.75. Whilst this paragraph strictly applies to development plans, the Scheme will provide an extensive source of renewable energy which will subsequently enable future developments to connect to a renewable energy supply. The Scheme therefore does not conflict with the intentions of paragraph 165 of the NPPF.

14.5.76. Paragraph 168 requires that: *"In determining planning applications, local planning authorities should a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions and b) recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emission"*.

14.5.77. The assessment has demonstrated that the Scheme will result in a net reduction in GHG emissions.

Commitments to Net Zero

14.5.78. In addition to the NPS and NPPF, it is appropriate to review how the Scheme aligns with national commitments to net zero by 2050. The CCC has established a "balanced net zero pathway" which considers feasible and cost-effective policy and technology interventions to ensure the UK can meet its new net zero target.

14.5.79. For power generation under this scenario, the CCC considers that 100% of power generation by 2050 will be low carbon, and for ground transport it forecasts that all ground transportation (apart from small number of HGVs) will be electrically powered. The CCC therefore, forecasts that power and ground transportation sectors are largely decarbonised by 2050 with any residual emissions removed through technical and/or natural means.

14.5.80. In providing renewable, low carbon energy, the Scheme therefore supports the Government in the transition to net zero, by providing energy which will allow the progressive removal of higher carbon electricity generation such as coal and natural gas.

14.5.81. The Scheme does not, therefore, conflict with efforts to meet the national net zero target and will actively contribute to the transition to net zero.

Summary

14.5.82. Overall, it is demonstrated that the Scheme complies with the requirements of national planning policy relevant to GHG emissions.

Local Policies

14.5.83. Overall, the Scheme aligns with Strategic Policy 58 of Doncaster Council's Local Plan since:

- It presents a scheme that will generate power from light (Section A); and
- It has demonstrated that it will deliver an environmental benefit insofar as the Scheme results in energy with a lower carbon intensity factor than other fuels (Section B).

14.5.84. Overall, the Scheme aligns with Policy CS18 of the North Lincolnshire Core Strategy since:

- It presents a scheme that utilises natural resources efficiently and sustainably;
- Contributes to reducing national CO_2 emissions (paragraph 4);
- Where possible, the construction phase will reuse and recycle materials (paragraph 6); and
- Will contribute to improving the quality of the air, since the use of solar-generated energy will reduce the need for combustion processes (paragraph 10).

14.5.85. In relation to the local policies, the Scheme may also incorporate an electric vehicle charging hub and vehicle parking. The hub would be available to members of the local community.

14.6. Mitigation, Enhancement and Residual Effects

Mitigation by Design

Air Quality

14.6.1. Measures to mitigate dust emissions will be required during the construction phase of the Scheme in order to minimise effects upon nearby sensitive receptors.

14.6.2. The Order Limits have been identified as a *High* Risk site during earthworks, construction and for trackout, as set out in **Table 14-14**. Comprehensive guidance has been published by the IAQM **[Ref. 14-16]** that describes measures that should be employed, as appropriate, to reduce the impacts, along with guidance on monitoring during demolition and construction **[Ref. 14-48]**. This reflects best practice experience and has been used, together with the professional experience of the consultant who has undertaken the dust impact assessment and the findings of the assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in **ES Appendix 14.5 Construction Mitigation [APP-119]**.

14.6.3. As explained in paragraph 14.5.37, the judgement that the Scheme is High Risk is likely to be conservative given the likely phasing of work across the Order Limits. However, this ensures that the mitigation defined in **ES Appendix 14.5 Construction Mitigation [APP-119]** are sufficiently robust to minimise emissions during the construction phase as far as practicable.

14.6.4. In addition, an **Outline CEMP [Document Reference 7.1 Revision 3]** and **Outline CTMP [Document Reference 7.7 Revision 2]** will be adopted to minimise the environmental impacts of the construction works. The mitigation measures described above will be integrated into the **Outline CEMP [Document Reference 7.1 Revision 3]** and may require monitoring.

14.6.5. To minimise vehicle emissions, routing arrangements will be in place such that vehicles will not be able to travel through the village of Thorne. This will be secured by DCO requirement as part of the **Outline CEMP [Document Reference 7.1 Revision 3]** and **Outline CTMP [Document Reference 7.7 Revision 2].**

14.6.6. Further, the distance between any areas of NRMM operation and sensitive receptors will be maximised, as far as possible, and all vehicles and plant will be switched off when not in use; this is specified as part of the **Outline CEMP [Document Reference 7.1 Revision 3].**

14.6.7. Where mitigation measures rely on water, only sufficient water will be applied to damp down the material and unnecessary usage will be avoided. There should not be any excess to potentially contaminate local watercourses.

Greenhouse Gases

14.6.8. Reducing GHG emissions during construction would include consideration of:

- Minimising the use of construction materials through recycling and reuse of materials where possible, and ensuring that surplus materials are not ordered;

- The procurement of sustainable materials, with consideration to the embodied carbon footprint of the materials and components, from the extraction of the raw materials to the production of the final construction products; and

- The transport of products between suppliers and the Scheme.

14.6.9. The Scheme is designed to operate for 40 years without replacement of PV modules, extending their design life as far as possible and avoiding emissions associated with manufacture, shipping and installation of replacement modules during the Scheme's lifetime.

14.6.10. An **Outline CEMP [Document Reference 7.1 Revision 3]** has been prepared which sets out mitigation measures and environmental management controls for the construction works. The CEMP defines, amongst other things, the hours of operation, dust control measures and vehicle emissions control. In addition to the environmental management measures and procedures (such as noise control, protection of trees and ecology and water usage), consideration shall also be given to construction materials quantities and best practice environmental standards for construction sites. The Site will also be registered with the UK's Considerate Constructors Scheme.

14.6.11. During construction, construction materials with low embodied carbon and from sustainable sources will be used where possible, and good practice measures will be employed on site to minimise energy use from construction activities. Materials will be reused or recycled where possible and waste to landfill will be avoided.

14.6.12. In terms of construction transport, the **Outline CTMP [Document Reference 7.7 Revision 2]** will reduce the environmental impact from the construction stage and optimise the efficient delivery and collection of goods and materials to the Scheme.

14.6.13. Further, the Scheme will coordinate minibuses to shuttle the majority of general operatives to each of the construction compounds to minimise the number of vehicle movements generated during the construction phase.

Additional Mitigation

Air Quality

Construction

14.6.14. Beyond the management plans, and the measures contained within, embedded in the design of the Scheme, no additional mitigation is necessary for the construction phase.

Operation

14.6.15. The assessment has demonstrated that the Scheme would not cause any exceedances of the air quality objectives, and that the overall effect of the Scheme is 'not significant'. It is, therefore, not considered appropriate to propose mitigation measures beyond those included by design.

14.6.16. Measures to reduce pollutant emissions from road traffic are principally being delivered in the longer term by the introduction of more stringent emissions standards, largely via European legislation (which is written into UK law).

Greenhouse Gases

14.6.17. Detailed measures to minimise GHG emissions through all stages of the Scheme from construction to operation and eventually decommissioning will be developed during detailed design as part of continued evolution of the **Outline CEMP [Document Reference 7.1 Revision 3]**, **Outline Operational Environmental Management Plan (OEMP) [Document Reference 7.2 Revision 2]** and **Outline Decommissioning Environmental Management Plan (DEMP) [Document Reference 7.3 Revision 3]** documents.

Mitigation Measures

14.6.18. A summary of the mitigation measures proposed for air quality and greenhouse gas emissions are set out in **Table 14-19**.

Table 14-19 Mitigation

REF	MEASURE TO AVOID, REDUCE OR MANAGE ANY ADVERSE EFFECTS AND/OR TO DELIVER BENEFICIAL EFFECTS	HOW MEASURE WOULD BE SECURED [A]		
		By Design	By S.106	By DCO Requirements
1	Implementation of CEMP			X
2	Implementation of OEMP			X
3	Implementation of CTMP			X
4	Implementation of DEMP			X
5	Routing restrictions through Thorne, secured through the CTMP			X
6	Construction dust mitigation measures outlined in **ES Appendix 14.5 Construction Mitigation [APP-119]**.			X

[a] Whilst for the purposes of the assessment, the management plans have been considered as embedded in the design of the Scheme, the plans will all be secured by DCO requirement.

Enhancements

Air Quality

14.6.19. In terms of air quality, it is unlikely that the Scheme will generate any enhancements during the construction phase. During operation, the Scheme will enhance air quality beyond the Order Limits since it will reduce the need for combustion to generate electricity.

Greenhouse Gases

14.6.20. It has been demonstrated that the Scheme leads to saving in GHG emissions compared to conventional energy generation; the transition from non-renewable sources to energy generated by the Scheme will, therefore, lead to reductions in CO_2e emissions over the lifetime of the Scheme.

Residual Effects

14.6.21. The residual effects set out within this Section are considered to remain valid regardless of which layout option is taken forward.

Air Quality

Construction

14.6.22. The IAQM guidance **[Ref. 14-16]** is clear that, with appropriate mitigation in place, the residual effects will normally be 'not significant'. The mitigation measures set out in this section and **ES Appendix 14.5 Construction Mitigation [APP-119]** are based on the IAQM guidance. With these measures in place and effectively implemented, the residual effects are judged to be **'not significant'**.

14.6.23. The IAQM does, however recognise that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. During these events, short-term dust annoyance may occur, however the scale of this would not normally be considered sufficient to change the conclusion that the overall effects will be **'not significant'**.

Operation

14.6.24. The residual effects will be the same as those identified in **Section 14.5**. The overall effects of the Scheme will be **'not significant'**.

Greenhouse Gases

14.6.25. **Table 14-20** summarises the residual significance of effects of the Scheme's GHG emissions, following the IEMA approach summarised in **Table 14-6**.

14.6.26. The assessment considers the context of the Scheme's GHG emissions, as well as the compliance of the Scheme with relevant national and local policies and the robustness, timeliness, and efficacy of the mitigation to avoid and reduce GHG emissions.

Table 14-20 Assessment of effects in accordance with ISEP (formerly IEMA) guidance [Ref. 14-11]

IEMA STEP	DESCRIPTION	ASSESSMENT	ALIGNMENT WITH IEMA

Step 1	Context	The Scheme will result in GHG emissions, primarily during the construction phase; operational emissions are a small proportion of the total footprint. Gross emissions are very small in the context of national carbon budgets. The Scheme will result in a net reduction in GHG emissions compared to conventional energy generation.	Beneficial: The Scheme's lifetime net GHG emissions are below zero and it causes a reduction in atmospheric GHG concentrations, compared to the without-Scheme baseline.
Step 2	Consistency with Policy	The Scheme has been demonstrated to meet the requirements of national and local policies relating to GHG emissions and climate change.	
	Robustness, timeliness and efficacy of mitigation	The Scheme will adopt good practice measures to avoid and reduce GHG emissions during the construction phase and over its lifetime secured through the **Outline CEMP [Document Reference 7.1 Revision 3]**, **Outline OEMP [Document Reference 7.2 Revision 2]** and **Outline DEMP [Document Reference 7.3 Revision 3]**.	

14.6.27. Although construction and operation of the Scheme contributes to local and national GHG emissions, will result in a net reduction in GHG emissions compared to conventional UK electricity generation methods it is designed to replace.

14.6.28. The Scheme therefore provides support towards the UK's target for net zero carbon emissions by 2050. The Scheme has also been demonstrated to meet all relevant policies related to GHG emissions and climate change.

14.6.29. Based on the significance criteria set out in **Table 14-6**, it is therefore judged that the Scheme will have an overall **beneficial impact** in terms of GHG emissions, and thus the effect is **'significant'**.

14.7. Summary

Introduction

14.7.1. This chapter of the ES identifies the potential effects of the Scheme on air quality and greenhouse gases. The assessment has considered the potential for effects to occur during the construction and operational phases of the Scheme; effects from decommissioning have been scoped out since emissions beyond 2050 should be approaching zero.

Baseline Conditions

14.7.2. The assessment has demonstrated that air quality conditions in the local area are generally good, with pollutant concentrations below the relevant air quality objectives.

14.7.3. The Scheme is currently used for agricultural purposes which are a small source of GHGs emissions. There are peat soils in areas throughout the Scheme but these are degraded and in poor condition and not sequestering large quantities of carbon.

Likely Significant Effects

14.7.4. The assessment has demonstrated that, with mitigation, the effect of construction dust on sensitive receptors will be 'not significant'. Traffic generated by the Scheme during both the construction and operational phases will be below published screening thresholds, and thus will be **'not significant'**.

14.7.5. The assessment has demonstrated that the Scheme will lead to residual GHG emissions across its lifetime; these mainly arise during the construction phase. However, once operational, the Scheme will generate electricity with a lower carbon factor than other non-zero fuels, such that its operation will lead to net reductions in GHG emissions, and facilitate a transition to net-zero. The overall GHG effects are judged to be **beneficial** and therefore **significant**.

Mitigation and Enhancement

14.7.6. A suite of mitigation measures, covering communications and site management, monitoring requirements and measures specific to each phase of work, will be

in place throughout the duration of the construction phase to ensure that the residual air quality effects are 'not significant'. These measures will be secured via DCO requirement as part of the **Outline CEMP [Document Reference 7.1 Revision 3]** and **Outline CTMP [Document Reference 7.2 Revision 2].**

14.7.7. The Scheme incorporates a number of best practice measures to minimise its GHG footprint, covering minimising the use of, and procurement of, sustainable construction materials, maintenance of the PV modules to maximise their design life and minimising waste to landfill; no additional mitigation is required beyond these measures. These measures will be developed during detailed design as part of continued evolution of the **Outline CEMP [Document Reference 7.1 Revision 3]**, **Outline Operational Environmental Management Plan (OEMP) [Document Reference 7.2 Revision 2]** and **Outline Decommissioning Environmental Management Plan (DEMP) [Document Reference 7.3 Revision 3]** documents.

Conclusion

14.7.8. The Scheme will not lead to significant effects on air quality and will have a significant beneficial effect in relation to reducing GHG emissions from the UK's energy supply.

14.7.9. **Table 14-21** provides a summary of effects, mitigation and residual effects.

Table 14-21 Summary of effects, mitigation and residual effects

Receptor / Receiving Environment	Description of Effect	Nature of Effect	Sensitivity Value	Magnitude of Effect	Geographical Importance	Significance of Effects	Mitigation / Enhancement Measures	Residual Effects
Construction								
Human Health Receptors	Effects from dust soiling	Temporary / Direct	High	Not Applicable	Local	Not Applicable – the guidance does not enable significance to be determined before mitigation	Suite of construction mitigation measures set out in **ES Appendix 14.5 Construction Mitigation [APP-119]**	**Negligible and Not Significant**
Human Health Receptors	Effects from emissions of PM_{10} and dust	Temporary / Direct	High	Not Applicable	Local	Not Applicable – the	Suite of construction mitigation	**Negligible and Not Significant**

	on human health					guidance does not enable significance to be determined before mitigation	measures set out in **ES Appendix 14.5 Construction Mitigation [APP-119]**	
Human Health Receptors	Effects on concentrations of NO_2, PM_{10} and $PM_{2.5}$ from construction traffic	Temporary / Direct	High	Not Applicable	Local	Negligible	Mitigation is not required	**Negligible and Not Significant**
Ecological Receptors	Effects from dust soiling and PM_{10}/dust emissions on sensitive ecological features	Temporary / Direct	High	Not Applicable	Local	Not Applicable – the guidance does not enable significance to be	Suite of construction mitigation measures set out in **ES Appendix 14.5 Construction**	**Negligible and Not Significant**

						determined before mitigation	**Mitigation [APP-119]**	
Operation								
Human Health Receptors	Effects on concentrations of NO_2, PM_{10} and $PM_{2.5}$ from road traffic	Permanent / Direct	High	Not Applicable	Local	Negligible	Mitigation is not required	**Negligible and Not Significant**
All	Lifecycle Emissions of GHGs (incl. construction)	Permanent / Direct	High	Not Applicable	International	Beneficial	Additional measures not required beyond best practice measures designed into Scheme	**Beneficial and Significant**

14.8. References

- **Ref. 14-1** Air Quality (England) Regulations 2000.
- **Ref. 14-2** Air Quality (England) (Amendment) Regulations 2002.
- **Ref. 14-3** Defra (2025) Review and Assessment: Technical Guidance LAQM.TG22, May 2025 Version.
- **Ref. 14-4** Defra (2025), $PM_{2.5}$ Targets: Interim Planning Guidance, Available: https://uk-air.defra.gov.uk/pm25targets/planning.
- **Ref. 14-5** European Union Directive 2008/50/EC.
- **Ref. 14-6** Moorcroft and Barrowcliffe et al. (2017) Land-Use Planning & Development Control: Planning for Air Quality v1.2. Institute of Air Quality Management, London.
- **Ref. 14-7** Doncaster Council (2024) 2024 Air Quality Annual Status Report (ASR).
- **Ref. 14-8** North Lincolnshire Council (2024) 2024 Air Quality Annual Status Report (ASR).
- **Ref. 14-9** Defra (2025) LAQM Support Website, Available at: https://laqm.defra.gov.uk/.
- **Ref. 14-10** Defra (2025) Air quality compliance data.
- **Ref. 14-11** ISEP (formerly IEMA) (2022) EIA Guide to: Assessing greenhouse gas emissions and evaluating their significance. 2nd edition
- **Ref. 14-12** Department for Energy Security & Net Zero (2024) Overarching National Policy Statement for Energy (EN-1).
- **Ref. 14-13** Bath University (2019) Inventory of Carbon and Energy v3.0.
- **Ref. 14-14** RICS (2023) Whole life carbon assessment for the built environment, 2nd edition.
- **Ref. 14-15** Department for Energy Security and Net Zero (2025) UK Government GHG Conversion Factors for Company Reporting.

- **Ref. 14-16** IAQM (2024) Guidance on the Assessment of Dust from Demolition and Construction v2.2.
- **Ref. 14-17** The Intergovernmental Panel on Climate Change (2014) AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability
- **Ref. 14-18** Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.
- **Ref. 14-19** Defra (2023) Air Quality Strategy: Framework for Local Authority Delivery.
- **Ref. 14-20** Defra (2019) Clean Air Strategy 2019.
- **Ref. 14-21** His Majesty's Stationary Office (2021), Environment Act 2021.
- **Ref. 14-22** Defra (2025) Environmental Improvement Plan 2025.
- **Ref. 14-23** Defra (2018) A Green Future: Our 25 Year Plan to Improve the Environment.
- **Ref. 14-24** DfT (2018) The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy.
- **Ref. 14-25** Department for Energy Security & Net Zero (2024) National Policy Statement for Renewable Energy Infrastructure (EN-3).
- **Ref. 14-26** Ministry of Housing, Communities & Local Government (2024) National Planning Policy Framework.
- **Ref. 14-27** Ministry of Housing, Communities & Local Government (2019) Planning Practice Guidance.
- **Ref. 14-28** Sheffield City Region (2019) Sheffield City Region Transport Strategy 2018-2040.
- **Ref. 14-29** Doncaster Council (2021) Local Plan 2015-2035.
- **Ref. 14-30** Doncaster Council (2022) Air Quality Technical Planning Guidance 2022.
- **Ref. 14-31** North Lincolnshire Council (2011) Core Strategy.

- **Ref. 14-32** Defra (2017) Air quality plan for nitrogen dioxide (NO_2) in the UK.
- **Ref. 14-33** Defra (2018) Supplement to the UK plan for tackling roadside nitrogen dioxide concentrations.
- **Ref. 14-34** Doncaster Council (2018) Air Quality Action Plan.
- **Ref. 14-35** North Lincolnshire Council (2024) Air Quality Action Plan 2024 – 2029.
- **Ref. 14-36** His Majesty's Stationery Office (2008) Climate Change Act 2008.
- **Ref. 14-37** His Majesty's Stationery Office (2019) The Climate Change Act 2008 (2050 Target Amendment) Order 2019.
- **Ref. 14-38** His Majesty's Stationery Office (2021) The Carbon Budget Order 2021.
- **Ref. 14-39** His Majesty's Stationery Office (2023) Energy Act 2023.
- **Ref. 14-40** HM Government (2021) Net Zero Strategy: Build Back Greener.
- **Ref. 14-41** DfT (2021) Decarbonising Transport. A Better, Greener Britain.
- **Ref. 14-42** HM Government (2020) Energy White Paper. Powering our Net Zero Future.
- **Ref. 14-43** Royal Courts of Justice (2018) Judgement on Case No. CO/4922/2017.
- **Ref. 14-44** Natural England (2021) Carbon storage and sequestration by habitat: a review of the evidence (second edition).
- **Ref. 14-45** Department for Energy Security & Net Zero (2025) Research and analysis: Fuel mix disclosure data table
- **Ref. 14-46** Luxembourg Institute of Science and Technology (LIST) (2021) Life cycle assessment of electricity generation options. Available: https://unece.org/sites/default/files/2021-09/202109_UNECE_LCA_1.2_clean.pdf
- **Ref. 14-47** British Geological Survey (2025) UK Soil Observatory Map Viewer.

- **Ref. 14-48** IAQM (2018) Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites v1.1

14.9. Glossary

TERM	DESCRIPTION
AADT	Annual Average Daily Traffic
AMCT	Annual Mean Concentration Target (for $PM_{2.5}$)
AQAP	Air Quality Action Plan
AQC	Air Quality Consultants Limited
AQMA	Air Quality Management Area
ASR	Annual Status Report
BESS	Battery Energy Storage System
CCC	Committee on Climate Change
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CEMP	Construction Environmental Management Plan
CO_2	Carbon dioxide
CO_2e	Term used for describing different greenhouse gases in a common unit. For any greenhouse gas, CO_2e is the amount of CO_2 that would have the equivalent global warming effect
CTMP	Construction Traffic Management Plan
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DEMP	Decommissioning Environmental Management Plan

DESNZ	Department for Energy Security & Net Zero
DfT	Department for Transport
EPD	Environmental Performance Declarations
EPUK	Environmental Protection UK
ES	Environmental Statement
EU	European Union
GHG	Greenhouse Gas
GIA	Gross Internal Area
GWh	Gigawatt hours
GWP	Global Warming Potential
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
IAQM	Institute of Air Quality Management
IPCC	Intergovernmental Panel on Climate Change
IEMA	Institute of Environmental Management and Assessment
ISEP	Institute of Sustainability and Environmental Professionals
JAQU	Joint Air Quality Unit
LAQM	Local Air Quality Management
LDV	Light Duty Vehicle
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NO_2	Nitrogen dioxide

OEMP	Operational Environmental Management Plan
OEP	Office for Environmental Protection
PEIR	Preliminary Environmental Information Report
PERT	Population Exposure Reduction Target (for $PM_{2.5}$)
PM_{10}	Small airborne particles, more specifically particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Small airborne particles less than 2.5 micrometres in aerodynamic diameter
PPG	Planning Policy Guidance
PV	Photovoltaic (Module)
RICS	Royal Institution of Chartered Surveyors
µg/m³	Microgrammes per cubic metre
ZEV	Zero Emission Vehicle