

LIGHTHOUSE GREEN FUELS PROJECT

Preliminary Environmental Information Report

Chapter 5: Air Quality

The Inspectorate Reference: EN010150

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Volume 1

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5. AIR QUALITY

5.1. INTRODUCTION

- 5.1.1. This Chapter reports the preliminary assessment of likely significant effects of the Proposed Scheme on air quality and describes:
- Relevant policy, legislation and guidance;
 - EIA Scoping Opinion¹ and consultation undertaken to date;
 - Potential effects of the Construction Phase from emissions of dust and particulate matter generated by construction-related activities, for example, site clearance, stockpiling and materials transport;
 - Preliminary assessment of the potential effects of the operation of the Proposed Scheme based on available datasets;
 - Scheme-specific air quality monitoring of NO₂, SO₂, deposited dust and NH₃; and
 - Any relevant mitigation measures and residual effects from the Proposed Scheme.
- 5.1.2. For both human and ecological receptors, air quality impacts can occur because of direct exposure to pollution in ambient air, but also as a result of the deposition of pollutants on the surface of the ground and ecological receptors.
- 5.1.3. The preliminary air quality impact assessment presents an overview of the proposed methodology and approach to assessing impacts, the scenarios under consideration and potential impacts on sensitive receptors during construction, operation and decommissioning.
- 5.1.4. It is anticipated that the ES, following a risk-based approach, will assess potential impacts due to dust and particulate matter emissions from construction and decommissioning qualitatively and operational impacts quantitatively using detailed dispersion modelling.
- 5.1.5. This is a preliminary assessment that will be finalised after consultation with relevant local authorities, the Environment Agency and Natural England.
- 5.1.6. The assessment of the impact of air quality on designated ecological sites and notable habitats is contained in **Chapter 7: Terrestrial Ecology (Volume 1)**.
- 5.1.7. This Chapter should be read in conjunction with the following Figures:
- **Figure 5-1 (Volume 2)**: Background 2023 NO₂ Concentrations;
 - **Figure 5-2 (Volume 2)**: Background 2028 NO₂ Concentrations;
 - **Figure 5-3 (Volume 2)**: Background 2023 NO_x Concentrations;
 - **Figure 5-4 (Volume 2)**: Background 2028 NO_x Concentrations;
 - **Figure 5-5 (Volume 2)**: Background 2023 PM₁₀ Concentrations;
 - **Figure 5-6 (Volume 2)**: Background 2028 PM₁₀ Concentrations;

- **Figure 5-7 (Volume 2):** Background 2023 PM_{2.5} Concentrations;
- **Figure 5-8 (Volume 2):** Background 2028 PM_{2.5} Concentrations;
- **Figure 5-9 (Volume 2):** Background 2019-2021 NH₃ Concentrations;
- **Figure 5-10 (Volume 2):** Background 2019-2021 Rates of Nutrient Nitrogen Deposition;
- **Figure 5-11 (Volume 2):** Construction Dust Study Area; and
- **Figure 5-12 (Volume 2):** Baseline Air Quality Monitoring Locations.
- **Figure 5-13 (Volume 2):** Roads Model Receptors and Modelled Road Network.
- **Figure 5-14 (Volume 2):** Construction Phase Roads Model NO₂ Impact.
- **Figure 5-15 (Volume 2):** Operational Phase Roads Model NO₂ Impact.
- **Figure 5-16 (Volume 2):** Operational SAF NO₂ Annual PC
- **Figure 5-17 (Volume 2):** Operational SAF NO₂ Hourly PC
- **Figure 5-18 (Volume 2):** Operational SAF SO₂ 15-minute PC
- **Figure 5-19 (Volume 2):** Operational SAF SO₂ Daily PC
- **Figure 5-20 (Volume 2):** Operational SAF UHC Annual PC

5.1.8. Additionally, this Chapter should be read in conjunction with the following Appendices:

- **Appendix 5A (Volume 3):** Designated Sites.
- **Appendix 5B (Volume 3):** Construction Phase Dust Assessment
- **Appendix 5C (Volume 3):** Point Source Modelling Assessment
- **Appendix 5D (Volume 3):** Road Traffic Modelling Assessment
- **Appendix 5E (Volume 3):** Detailed Modelling Results

5.2. MATTERS SCOPED OUT

EIA Scoping Opinion

5.2.1. The matters which have been scoped out of the air quality assessment in agreement with the EIA Scoping Opinion¹ are as follows:

- Air emissions from Fischer-Tropsch (FT) Synthesis;
- Odour emissions from surface water pond; and
- Odour emissions from feedstock silos.

5.2.2. It should be noted that demolition of TV1 and TV2 facilities is being carried out under a separate consent (as described in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**).

Scoped Out Based on Preliminary Design

5.2.3. The following additional matters are scoped out based on preliminary design information. This information will be provided to the Planning Inspectorate (the Inspectorate) in the ES and relates to the following sources:

- SAF Plant:
 - Gasification (odour emissions):
 - During gasification, small levels of H₂S and COS will be generated in the gasifier trains, which are a potential odour emission source. However, the gasifier trains will be fully-enclosed systems, which will eliminate any potential for odour emissions.
 - Syngas clean-up takes place in a sealed system therefore no emissions are expected from this process.
 - Product Upgrading Unit:
 - The fractionator is assumed to be a sealed vessel and the charge heater and fractionator heaters are electric, therefore no emissions are expected from this process.
- Non-SAF Plant:
 - Emissions from marine vessels (NO₂, PM₁₀ and PM_{2.5}):
 - Construction Phase marine vessel movements are estimated to be 300 per year. This source emission can be screened out when these movements are compared against the LAQM.TG(22)²¹ criterion of 5,000 bulk cargo movements per year; and
 - Operational Phase marine vessel movements are estimated to be 1 per week (52 per year). This source emission can be screened out when these movements are compared against the LAQM.TG(22)²¹ criterion of 5,000 bulk cargo movements per year.
 - Wastewater treatment plant (odour emissions):
 - Effluent streams from the wastewater treatment plant will be treated in a covered and sealed treatment plant eliminating odour emissions.
 - Bulk liquid storage (fugitive air emission):
 - The by-products and products from the SAF process (SAF and naphtha) will be stored in an existing liquid tank farm to the east of the Proposed Scheme. A smaller buffer storage area is also proposed at the site of the Proposed Scheme. Given the nature of SAF and naphtha there is the potential for VOC emissions which will be managed in accordance with Best Available Techniques (BAT) and regulated by the environmental permit. Therefore, good practice mitigation will be embedded in the final design, which will be available at the ES.
 - Pipeline and cable connections (import and export) and utility corridors (fugitive air emission):
 - There is a small risk of accidental and routine maintenance releases from pipework. However, best practice mitigation measures will be implemented to minimise releases.
 - SAF and Naphtha transfer (fugitive air emission):

- Where final fuels are transferred by sealed pipeline, fugitive emissions of vapour will not occur because the pipeline will be pressure-tested.
- Rail terminal transfers (fugitive air emission):
 - Where final fuels are transferred by rail, good practice mitigation will be embedded in the final design to minimise any potential fugitive air emissions.
- Marine transport infrastructure (fugitive air emission):
 - Where final fuels are transferred by marine vessels, good practice mitigation will be embedded in the final design to minimise any potential fugitive air emissions.

Scoped Out Pending Final Design

5.2.4. Further detailed design information will be provided at the ES stage to justify the scoping out of emission sources to meet the requirement of the Inspectorate. Where appropriate, this information will be screened to demonstrate no significant effects for the following SAF-Plant sources:

- Syngas Clean-up (air emissions); and
- Auxiliary partial oxidation reactor (air emissions).

5.3. POLICY, LEGISLATION, AND GUIDANCE

5.3.1. The policy, legislation, and guidance relevant to the assessment of air quality for the Proposed Scheme is detailed in **Appendix 4A: Policy, Legislation and Guidance (Volume 3)**. The policy, legislation and guidance relevant to this Chapter is outlined below:

- Policy:
 - Overarching National Policy Statement for Energy (EN-1) 2023²;
 - National Planning Policy Framework 2023³;
 - The Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2) ⁴;
 - Clean Air Strategy 2019⁵;
 - Environmental Improvement Plan 2023⁶;
 - Stockton-on-Tees Borough Council (STBC) Local Plan 2019⁷;
 - Middlesbrough Council Local Development Framework Core Strategy 2008⁸;
 - and
 - Redcar and Cleveland Borough Council (RCBC) Local Plan 2018⁹.
- Legislation:
 - The Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018¹⁰;

- The Environmental (Miscellaneous Amendments) (EU Exit) Regulations 2020¹¹;
- The Air Quality (England) Regulations 2000 — SI 2000 928¹²;
- The Air Quality (England) (Amendment) Regulations 2002 – SI 2002 3043¹³;
- The Air Quality Standards Regulations 2010 – SI 2010 1001¹⁴;
- Environment Act 1995¹⁵;
- Environment Act 2021¹⁶; and
- The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023¹⁷.
- Guidance:
 - Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning For Air Quality v1.2¹⁸;
 - IAQM Guidance on the Assessment of Dust from Demolition and Construction v1.1¹⁹;
 - Highways England Design Manual for Roads and Bridges (DMRB) LA 105²⁰
 - IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning²¹;
 - DEFRA and the Devolved Administrations Local Air Quality Management Technical Guidance (TG22) (LAQM.TG(22))²²;
 - DEFRA and the Environment Agency Air emissions risk assessment for your environmental permit²³;
 - IAQM A Guide to the assessment of air quality impacts on designated nature conservation sites Version 1.1²⁴;
 - Environment Agency AQTAG06 Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air²⁵;
 - Joint Nature Conservation Committee (JNCC) Report No. 665: Nitrogen Futures²⁶;
 - IAQM Guidance on the assessment of odour for planning²⁷;
 - Environment Agency H4 Odour Management²⁸;
 - World Health Organisation Air Quality Guidelines for Europe²⁹; and
 - European Monitoring and Evaluation Programme (EMEP)/European Environment Agency (EEA) Air pollutant emission inventory guidebook³⁰.

5.4. SCOPING OPINION AND CONSULTATION

5.4.1. An EIA Scoping Opinion¹ was received by the Applicant from the Inspectorate on behalf of the Secretary of State on 01 September 2023. The responses from the Inspectorate and statutory consultees in relation to air quality, and how these requirements should be addressed by the Applicant, are set out in **Table 5-1** below.

Table 5-1: Summary of the EIA Scoping Opinion in relation to Air Quality

ID	Description	Scoping Opinion Comments	Response
2.2.4	The Net Zero Teesside Project	<p><i>“The Proposed Development proposes to connect to the Net Zero Teesside project (NZT). It is stated that it would be preferable for the Proposed Development to be connected to NZT from the start of operation. However, an alternative scenario of a delay of up to 5 years from the Proposed Development operational phase to the connection with NZT is assumed as a worst-case scenario to factor in start-up delays on NZT. The ES should explain why 5 years is considered a reasonable worst-case scenario regarding start-up delay.</i></p> <p><i>It is unclear what is proposed for the carbon dioxide (CO₂) emissions for this five-year period should there be delays to NZT. Furthermore, should NZT not gain development consent it is unclear what would happen to the produced CO₂.</i></p> <p><i>The ES should consider multiple options where there is uncertainty, particularly within the assessment of greenhouse gases. The ES should also assess the potential for cumulative effects with NZT, as well as other projects.”</i></p>	<p>Since the EIA Scoping Stage, the Applicant has amended the design of the SAF Plant to enable it to process waste biomass and/or biomass residues in addition to waste feedstocks, for example Solid Recovered Fuel (SRF) or Refuse Derived Fuel (RDF). Processing biomass feedstocks generates biogenic CO₂ which is effectively carbon neutral, since it does not contribute more carbon to the atmosphere. The Applicant intends to process biomass feedstocks until CO₂ Transport and Storage (T&S) Infrastructure is available.</p> <p>As discussed in Chapter 2: Site and Proposed Scheme Description (Volume 1), two scenarios are currently under consideration for management of carbon dioxide emissions from the Biocarbon Feedstock.</p> <ul style="list-style-type: none"> ■ Connection to NZT or alternative CO₂ T&S from the start of the Proposed Development’s Operational Phase. The Secretary of State has recently granted development consent for NZT; and ■ Delayed connection to NZT or alternative CO₂ T&S Infrastructure. <p>Upon connection to NZT or alternative CO₂ T&S Infrastructure, the potential for alternative feedstocks will be investigated. Waste feedstocks (SRF or RDF) are expected to be processed when the SAF Plant has access to Carbon Capture and Storage (CCS) infrastructure. Until that time, biomass feedstocks will</p>

ID	Description	Scoping Opinion Comments	Response
			<p>be used to enable the CO₂ released from the process to be carbon neutral.</p> <p>Future connectivity to local hydrogen projects is also being explored, as a further fuel source for the existing CCGT and/or auxiliary boiler, as discussed in Section 2.5 of Chapter 2: Site and Proposed Scheme Description (Volume 1) to help boost the production of SAF and reduce CO₂ emissions.</p> <p>The connection to NZT or alternative CO₂ T&S Infrastructure will be confirmed in the ES, including in relation to cumulative effects.</p>
3.1.1	Syngas clean-up	<p><i>“The Applicant proposes to scope this matter out on the basis that this is a closed process and there are no emissions points between the input from the previous process and output to the following process. Paragraph 2.2.12 states that by-products of syngas conversion including particulate matter, ammonia, and sulphur are removed from the syngas. It is unclear where these gases would be removed to and therefore whether there is potential for these to be emitted to air. On the basis of the information provided the Inspectorate is not in a position to scope this matter out at this stage. The ES should assess the potential for likely significant effects to occur or demonstrate the absence of a likely significant effects e.g., through appropriate design measures.”</i></p>	<p>Key emission sources from the Syngas process have been identified and will be eliminated because it is a closed process.</p>
3.1.2	FT synthesis	<p><i>“The Applicant proposes to scope this matter out on the basis that this is a closed process and there are no emissions points between the input from the previous process and output to the following process. Figure 2-3 and paragraph 2.2.15 states that by-products of the FT process would be recycled and used in the integrated combined cycle gas turbine</i></p>	<p>No response required; matter scoped out.</p>

ID	Description	Scoping Opinion Comments	Response
		<p><i>(CCGT) power plant for power generation. The Inspectorate has considered the characteristics of the Proposed Scheme and is content that, based on the closed process, significant effects from emissions to air are unlikely to occur and therefore this matter can be scoped out of further assessment.”</i></p>	
<p>3.1.3</p>	<p>Upgrading</p>	<p><i>“The Applicant proposes to scope this matter out on the basis that this is a closed process and there are no emissions points between the input from the previous process and output to the following process. Table 5-7 states that it is assumed that this would be a sealed vessel however, this phrasing suggests this is uncertain. It is also noted that there is potential for NOx emissions from the fractionator heater exhausts, although it is noted that measures are proposed to reduce emissions (namely the use of Selective Catalytic Reduction).</i></p> <p><i>Based on the information provided it is unclear whether a sealed vessel is confirmed. Furthermore, there is potential for exhaust emissions to occur. Specific quantities of Nitrogen oxides (NOx) emissions are not provided. The Inspectorate does not agree to scope this matter out based on the information provided. The ES should include an assessment of this matter, or evidence of agreement with the relevant consultation bodies that this matter can be scoped out and the absence of a likely significant effect.”</i></p>	<p>The ES will include a detailed description of the design to confirm that the vessel is sealed, and there is no source of emission. Fractionator exhausts in the current design are electric with no exhausts. Details will be confirmed at the ES stage.</p>
<p>3.1.4</p>	<p>Utilities</p>	<p><i>“The Applicant proposes to scope this matter out on the basis that no emissions are expected. No further justification is provided. The Inspectorate understands that ‘utilities’ in this context refers to the pipelines required for the transportation of heat and power, gaseous oxygen, nitrogen, SAF, Green Naphtha,</i></p>	<p>Fugitive emissions to air will be limited in accordance with BAT and managed by the environmental permit.</p>

ID	Description	Scoping Opinion Comments	Response
		<p><i>carbon dioxide (CO₂), and natural gas etc., as described in paragraph 2.2.27.</i></p> <p><i>The Inspectorate is content that emissions to air are likely to be minimal under a normal mode of operation and therefore is content to scope this matter out. However, the ES should describe the design measures in place to limit the leakage of emissions to air and/or any measures in place during an abnormal mode of operation, such as during an emergency procedure, which would limit the emissions to air. The Applicant is referred to ID 3.1.18 below.”</i></p>	
3.1.5	Wastewater Treatment Plant	<p><i>“The Applicant proposes to scope this matter out on the basis that effluent streams would be treated in a covered and sealed treatment plant and therefore there is no potential for emissions to air including odour.</i></p> <p><i>The Inspectorate is content to scope this matter out of further assessment on the basis that effluent would be within a covered and sealed plant. However, the ES should provide detail on the effluent streams and the measures in place to limit the potential for emissions to air including odour.”</i></p>	The ES will include a detailed description of the design to confirm that the Wastewater Treatment Plant is sealed, and there is no source of emission.
3.1.6	Surface water pond	<p><i>“The Applicant proposes to scope out this matter on the grounds that the surface water pond is proposed to collect uncontaminated surface water and therefore no odour emissions are expected. On the basis that the surface water pond would be used for uncontaminated surface water only, the Inspectorate considers that significant effects from odour emissions are unlikely to occur and therefore agrees that this matter can be scoped out of further assessment.”</i></p>	The surface water pond will only be used for uncontaminated surface water, and, therefore, odour emissions are scoped out of further assessment.

ID	Description	Scoping Opinion Comments	Response
3.1.7	Sub-stations and ancillary equipment	<i>“The Applicant proposes to scope out this matter on the basis that no emissions are expected unless backup generators are present. No further details regarding the backup generators are provided, such as fuel type, number of generators, and likelihood of usage. On this basis the Inspectorate does not agree to scope this matter out at this stage.”</i>	Further details on the presence of backup generators in the design will be provided in the ES. This will include a proportionate assessment of emissions from the generators if they are present. Confirmation of the presence and nature of backup generators in the design will determine whether this matter can be scoped out of the ES.
3.1.8	Maintenance and laydown areas (TAR 1 & 2)	<i>“The Applicant proposes to scope out this matter on the basis that no emissions are expected. Based on the characteristics of these components of the Proposed Scheme (namely the areas for receipt, storage, and assembly of construction equipment, components, and materials as stated in Table 2-1) the Inspectorate agrees that significant effects resulting from emissions to air are unlikely and therefore this matter can be scoped out of further assessment. However, the ES should describe any best practice measures in place regarding the storage of materials to limit the potential for dust emissions. The acronym ‘TAR’ is not included within the Scoping Report Glossary; for clarity this should be defined in the ES.”</i>	The ES will describe best practice measures for the storage of materials and mitigation of vehicular and plant emissions in the management of emissions from the maintenance and laydown (turnaround areas (‘TAR’)). This acronym is included in the updated glossary as part of this PEIR.
3.1.9	Feedstock silos	<i>“The Applicant proposes to scope this matter out on the basis that the feedstock is odourless. The Inspectorate is content that this matter can be scoped out of further assessment subject to further details regarding the feedstock being provided within the ES; see ID 2.2.3 above.”</i>	Further detail regarding the feedstock will be provided in the ES.
3.1.10	Marine transport infrastructure – operation	<i>“The Applicant proposes to scope this matter out on the basis that emissions from marine traffic are likely to be small and impacts limited to “a limited number of human receptors and habitats in the Tees Estuary”. As stated in paragraphs 20.7.2 and 20.7.3, operational</i>	Operational Phase marine vessel movements are estimated to be 1 per week (52 per year). This source emission can be screened out when these movements are compared against the LAQM.TG(22) ²¹ criterion of 5,000 bulk cargo movements per year. As the number of movements is

ID	Description	Scoping Opinion Comments	Response
		<i>marine movements are still be investigated and agreed. In the absence of further details on operational marine traffic movements the Inspectorate is not in a position to scope this matter out at this stage. The ES should include an assessment of this matter, or evidence demonstrating agreement with the relevant consultation bodies that this matter can be scoped out of assessment and the absence of a likely significant effects."</i>	well below the criteria for screening in, this matter can be scoped out of further assessment.
3.1.11	Detailed assessment of operational traffic emissions	<i>"The Scoping Report states that a detailed assessment of operational traffic emissions will not be undertaken as traffic numbers are unlikely to exceed relevant thresholds. A qualitative assessment is proposed instead. Indicative operational traffic numbers are not provided within the Scoping Report. The ES must present the worst-case scenario for traffic movements and either demonstrate that these are below the relevant threshold which would trigger the requirement for further assessment or, where these movements are above the relevant threshold, provide a detailed assessment of air quality impacts or evidence of agreement with the relevant consultation bodies."</i>	The worst-case scenario for traffic movements based on the latest design will be screened against the relevant thresholds in the ES. The level of detail in the assessment and requirement for consultation will depend on whether these criteria are met in accordance with industry guidance. Further details on current anticipated operational traffic movements are provided in Section 5.8
3.1.12	Study Area for human receptors	<i>"Paragraph 5.3.2 states that a 2km Study Area will be used for discrete predictions whilst a "receptor grid out to 10km will be used in order to establish where the limits to impacts may lie". It is unclear on what basis the 2km and 10km Study Areas for human receptors have been proposed. The ES should justify the Study Area(s) used in line with relevant guidance, modelling, and/or agreement from relevant stakeholders."</i>	A full description of the justification for the choice of Study Area is provided in Section 5.6 Study Area of this Chapter. The overall Study Area is 10km. The Study Area will be reviewed during initial modelling to ensure that maximum impacts are captured.
3.1.13	Baseline	<i>"Paragraph 5.4.42 states that air quality monitoring will also be completed to characterise the baseline</i>	A baseline monitoring programme has been developed in consultation with STBC and Natural

ID	Description	Scoping Opinion Comments	Response
		<p><i>conditions but the pollutants to be monitored are not provided. The ES should characterise the baseline environment for each of the pollutants the Proposed Scheme would produce, including amines and their derivatives where possible. Effort should be made to agree the suitability of baseline monitoring with the relevant consultation bodies and evidence of this should be provided within the DCO application.”</i></p>	<p>England as described in Table 5-3 The air quality monitoring programme will characterise ambient concentrations of NO₂, SO₂, NH₃ and deposited dust. A detailed description of the monitoring programme is provided in Section 5.10</p>
<p>3.1.14</p>	<p>Cumulative assessment</p>	<p><i>“The Scoping Report states that the cumulative emissions are assumed to be the same as that for operational phase emissions. It is stated that emissions data from neighbouring industrial processes is not expected to be available and therefore will not be included within the cumulative assessment, however it is assumed that these emissions would be included within the DEFRA pollutant backgrounds. The Inspectorate is content that existing operational industrial processes in the vicinity of the Proposed Scheme would be accounted for within the background air quality mapping. However, projects not yet consented and/or constructed should be considered within the cumulative assessment, including the NZT Project which the Proposed Scheme is proposing to connect to if consented. The Applicant should seek agreement from the local planning authorities (LPAs) regarding the other plans and projects to be included within the cumulative assessment.”</i></p>	<p>The ES will consider projects not yet consented and/or constructed in the cumulative assessment in consultation with relevant LPAs. Further details on the approach to cumulative effects can be found in Chapter 19: Cumulative Effects (Volume 1).</p>
<p>3.1.15</p>	<p>Dispersion modelling</p>	<p><i>“Paragraph 5.8.2 states that “where traffic data can be supplied for construction vehicles on the public highway and marine traffic on the River Tees” this will be screened against criteria set out in guidance. The wording of this phrase implies traffic data may not be</i></p>	<p>Preliminary design construction traffic data has been supplied and screened against relevant criteria. Preliminary traffic modelling for the Construction and Operational Phases has been undertaken as described in Section 5.3, with impacts and results</p>

ID	Description	Scoping Opinion Comments	Response
		<p><i>supplied and therefore emissions from traffic would not be screened.</i></p> <p><i>Paragraph 5.10.1 states that screening of construction traffic assumes the timely and accurate provision of traffic flow data. It is unclear what methodology is proposed should this data not be provided.</i></p> <p><i>For the avoidance of doubt, the ES should assess the likely significant effects of construction traffic on air quality should the anticipated traffic levels exceed thresholds set out within relevant guidance. Where uncertainty exist in the final type and quantity of construction vehicles to be used, a worst-case scenario should be used.”</i></p>	<p>described in Section 5.7. At the ES stage, final design construction traffic data will be provided and subsequently screened against relevant thresholds as part of the air quality assessment. An impact assessment will be completed at the level of detail consistent with guidance which will be determined by the outcome of the screening exercise. This will consider any uncertainty in the construction traffic datasets provided.</p>
3.1.16	Dust mitigation	<p><i>“The Scoping Report states that it is expected the impacts from construction dust “should be negligible and not significant” following the implementation of appropriate mitigation measures as determined by the dust risk assessment.</i></p> <p><i>Paragraph 5.6.1 provides typical mitigation measures for the construction phase. The Inspectorate would expect to see an outline dust mitigation plan and/or outline Construction Environmental Management Plan, which outlines the relevant mitigation measures, to be submitted as part of the application documents. The ES should appropriately cross-reference to mitigation measures within other management plans where appropriate.”</i></p>	<p>A preliminary dust risk assessment has been completed in Section 5.8 and provisional mitigation measures are provided in Section 5.7 and Section 5.9. The dust risk assessment will be revisited for the ES with updated design information incorporated. The resulting risk assessment rating and risk-specific mitigation measures will be incorporated into an Outline Dust Management Plan (ODMP) to be appended to the Outline Code of Construction Practice (OCoCP) as part of the application submission. Cross references to other management plans will be made as appropriate.</p>
3.1.17	Odour assessment	<p><i>“The wording within paragraph 5.9.10 implies that an odour assessment may be required. It is not clear what elements of the Proposed Scheme are likely to produce odour. Paragraph 5.9.10 refers to “odour-emitting plant or equipment” however Table 6-9 proposes to scope out impacts from the feedstock</i></p>	<p>A detailed summary of all likely sources of odour in addition to and including the feedstock silos, wastewater treatment and surface water pond will be provided in the ES based on the final design.</p>

ID	Description	Scoping Opinion Comments	Response
		<p><i>silos, wastewater treatment, and the surface water pond on the basis that they are odourless. It is unclear how the decision whether to conduct an odour assessment would be taken.</i></p> <p><i>The ES should provide estimates of the type and quantities of expected residues and emissions in line with Schedule 4 of the EIA Regulations. Likely significant effects should be assessed where these are likely to occur.”</i></p>	<p>An assessment of odour will be completed where any source cannot be eliminated by enclosure or the use of monitoring technologies to prevent odour creating conditions.</p>
<p>3.1.18</p>	<p>Leakage</p>	<p><i>“Table 6-9 (specifically the ‘Marine Transport Infrastructure’ box) refers to “evaporation of vapours during product transfer” however no further detail is provided on this. The ES should assess the potential for leakage of emissions to air across the whole process, as well as the risks and implications thereof to air quality.”</i></p>	<p>The AQ assessment of the ES will assess the potential for emissions leakage across the whole process. With reference to Section 5.7, embedded measures to contain leakage and a leak detection programme will form part of the design.</p>
<p>Natural England</p>	<p>ES</p>	<p><i>“Regulation 11 of the Infrastructure Planning Regulations 2017 - (The EIA Regulations) sets out the information that should be included in an Environmental Statement (ES) to assess impacts on the natural environment. This includes:</i></p> <ul style="list-style-type: none"> <i>ii. A description of the development – including physical characteristics and the full land use requirements of the site during construction and operational phases.</i> <i>iii. Appropriately scaled and referenced plans which clearly show the information and features associated with the development.</i> <i>iv. An assessment of alternatives and clear reasoning as to why the preferred option has been chosen.</i> 	<p>The AQ assessment of the ES will include an Air Quality Chapter and Technical Appendix to meet the requirements of the Infrastructure Planning Regulations 2017 - (The EIA Regulations) in consideration of consultation with Natural England as described in Table 5-2.</p>

ID	Description	Scoping Opinion Comments	Response
		<p>v. A description of the aspects and matters requested to be scoped out of further assessment with adequate justification provided.</p> <p>vi. Expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation etc.) resulting from the operation of the Proposed Scheme.</p> <p>vii. A description of the aspects of the environment likely to be significantly affected by the development including biodiversity (for example fauna and flora), land, including land take, soil, water, air, climate (for example greenhouse gas emissions, impacts relevant to adaptation, cultural heritage and landscape and the interrelationship between the above factors</p> <p>viii. A description of the likely significant effects of the development on the environment – this should cover direct effects but also any indirect, secondary, cumulative, short, medium, and long term, permanent and temporary, positive, and negative effects. Effects should relate to the existence of the development, the use of natural resources (in particular land, soil, water, and biodiversity) and the emissions from pollutants. This should also include a description of the forecasting methods to predict the likely effects on the environment.</p> <p>ix. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.</p> <p>x. An outline of the structure of the proposed ES.”</p>	
<p>UK Health</p>	<p>Environmental Public Health</p>	<p>“Our position is that pollutants associated with road traffic or combustion, particularly particulate matter and oxides of nitrogen are non-threshold; i.e., an exposed population is likely to be subject to potential</p>	<p>The policy, legislation, and guidance relevant to the assessment of air quality for the Proposed Scheme is detailed in Appendix 4A: Policy, legislation and guidance (Volume 3). The ES will include an Air</p>

ID	Description	Scoping Opinion Comments	Response
<p>Security Agency</p>		<p><i>harm at any level and that reducing public exposure to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards will have potential public health benefits. We support approaches which minimise or mitigate public exposure to non-threshold air pollutants, address inequalities (in exposure) and maximise co-benefits (such as physical exercise). We encourage their consideration during development design, environmental and health impact assessment, and development consent.”</i></p>	<p>Quality Impact Assessment Chapter and Technical Appendix to meet the requirements of the Infrastructure Planning Regulations 2017 - (The EIA Regulations). Within the Air Quality Chapter, final design embedded and additional mitigation measures will be laid out with the intention of minimising the exposure of human and ecological sensitive receptors to pollutants, including NO_x and particulate matter. Furthermore, the issue of minimising public health impacts and providing public health benefits will be discussed in Population and Human Health Chapter of the ES.</p>

5.4.2. **Table 5-2** provides a summary of the consultations undertaken to inform the air quality assessment to date.

Table 5-2: Consultation Summary Table

Date and Method of Consultation	Consultee	Summary of Key Topics Discussed and Key Outcomes
04 August 2023, Meeting	Stockton-on-Tees Environmental Health Officer (EHO)	Presented the approach to the air quality assessment and air quality monitoring. Stockton-on-Tees EHO in agreement. Stockton-on-Tees EHO requested monitoring of NO ₂ and SO ₂ in Cowpen Bewley village. Location of monitoring Site 7 moved to Cowpen Bewley village to comply.
10 August 2023 Meeting	Natural England	Presented the approach to the air quality assessment and air quality monitoring. Natural England in agreement.
20 September 2023 Email	Middlesbrough Environmental Health Officer	Presented the air quality monitoring approach. No comments provided.

5.5. ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

5.5.1. The air quality assessment of the Proposed Scheme has been undertaken in line with the legislation, policy and guidance described in **Section 5.2**.

PRELIMINARY DESIGN INFORMATION

5.5.2. With reference to **Section 5** some operational phase sources have been identified as potentially significant and are scoped into the assessment. However, some sources are scoped out on the basis that they will be eliminated through embedded and additional mitigation.

5.5.3. The Inspectorate has requested detailed design information to justify the scoping out of sources in the EIA Scoping Opinion¹ (**Table 5-1**). As evidence to justify scoping out, **Section 5.8** provides preliminary design information for each source excluded from the assessment.

POTENTIAL SIGNIFICANT EMISSION SOURCES AND ASSESSMENT METHODOLOGY

5.5.4. As identified in the EIA Scoping Report³¹, **Table 5-3** shows the potential emission sources which are considered to be significant and, where information is sufficient, have been considered further in this assessment. The matters scoped into the assessment are summarised below:

- Construction Phase:
 - Construction Phase Fugitive Dust;
 - Non-Road Mobile Machinery (NRMM); and
 - Construction Road Traffic Emissions.

- Operation Phase:
 - Emissions of Pollutants arising from the SAF Plant;
 - Emissions of Pollutants unrelated to the SAF Plant;
 - Operational Phase Fugitive Dust; and
 - Operational Road Traffic Emissions.

Table 5-3: Potential significant emission sources and assessment methodology for matters scoped in

ID	Component	Description	“Associated Equipment (AE)”, e.g. Columns and/or Stacks. *	Emission Source	Assessment Methodology
SAF Plant Site					
1	Feedstock Storage and Pre-Processing Area	<p>Onsite buffer storage for biomass and/or biocarbon feedstocks.</p> <p>Grinding / Pulverisation Unit(s) may also be housed in the Feedstock Storage & Pre-Processing Area.</p>	<p>Feedstock Storage Area (three options):</p> <p>Option 1 for Silos – multiple silo structures; and</p> <p>Option 2 for Bays – Bays per building – up to 4 Buildings.</p> <p>Option 3 for A-frame bunker storage– up to 2 A-frame buildings.</p>	Particulate matter suspended during Biocarbon Feedstock transfer	Operational Phase Fugitive Dust
2	Gasification Plant	This “island” consists of four “gasifier trains” which gasify Biocarbon Feedstock into a synthesis gas (syngas).	Up to 4 x Stacks	<p>Gasification of Biocarbon Feedstock may involve the production of NO_x and PM. Emissions are dependent on feedstocks.</p> <p>Heavy metals and other contaminants are removed from the process in the Syngas Clean-Up, which is an enclosed system, so no metal emissions are expected.</p> <p>The SAF Plant will be regulated by an environmental permit, which will be sought in parallel to the DCO process and determined separately to the DCO process by the Environment Agency, as discussed in Chapter 2: Site and Proposed</p>	Atmospheric Dispersion Modelling

ID	Component	Description	“Associated Equipment (AE)”, e.g. Columns and/or Stacks. *	Emission Source	Assessment Methodology
				Scheme Description (Volume 1).	
10	Flare Area	Three flare systems (high pressure (HP) and low-pressure (LP & LLP)) for emergency / abnormal operational scenarios.	Three flare stacks (high pressure (HP), low pressure (LP) and low low pressure (LLP)) The modelling approach in this preliminary assessment is described in Appendix 5C (Volume 3): Point Source Modelling Assessment.	Flaring may result in emissions of NO _x , SO _x and particulate matter along with trace elements but will only occur under emergency or abnormal scenarios.	Atmospheric Dispersion Modelling
11	Auxiliary Boiler	An Auxiliary Boiler will assist in shortening the plant start-up schedule. The boiler will generate additional steam for use in the Syngas Clean-up section of the plant. The Auxiliary Boiler will have multi-fuel capability, operating on either Biocarbon Feedstock, or process off-gases or natural gas. Steam generated by the Auxiliary Boiler may also be used for onsite power	1 stack. The modelling approach in this preliminary assessment is described in Appendix 5C (Volume 3): Point Source Modelling Assessment.	Potential for NO _x emissions. Exhausts will be equipped with SCR.	Atmospheric Dispersion Modelling

ID	Component	Description	“Associated Equipment (AE)”, e.g. Columns and/or Stacks. *	Emission Source	Assessment Methodology
		generation via a steam turbine generator (STG). Up to 49.9 MW of power generation is expected from the STG.			
15	Air Separation Unit	An air separation unit (ASU) to facilitate the production of oxygen and nitrogen required by the SAF Plant.	Cold Box and Cooling Tower	Depending on the source of energy, combustion products and emissions of volatile organic compounds (VOC): hydrochlorofluorocarbons (HCFC), chlorofluorocarbons (CFC), hydrofluorocarbons (HFC), chlorinated solvents or NH ₃ during maintenance or accidentally from the chillers.	Atmospheric Dispersion Modelling
16	Process Waste Storage	Waste storage area for Slag.	--	Stored in sealed silos, but potential for fugitive dust emissions during transfer	Operational Phase Fugitive Dust
18	General Administration & Storage Facilities	Offices, welfare, control room, warehousing, maintenance building, laboratories, garages and security.	--	Potential for oxides of nitrogen (NO _x), nitrogen dioxide (NO ₂) and particulate emissions from employee and support vehicles.	Atmospheric Dispersion Modelling and Road Traffic (NO ₂ , PM ₁₀ and PM _{2.5})
20	Existing CCGT Power Plant	The existing 49.9MW CCGT power plant comprises the following: Gas Turbine (GT) generators	Existing 3 stacks. The modelling approach in this preliminary assessment is described in Appendix 5C (Volume 3): Point Source	Potential for NO _x emissions from the 2x GT/HRSGs and 1x auxiliary boiler. All exhausts will be equipped with SCR.	Atmospheric Dispersion Modelling

ID	Component	Description	“Associated Equipment (AE)”, e.g. Columns and/or Stacks. *	Emission Source	Assessment Methodology
		<p>with Heat recovery steam generators (HRSG), Auxiliary boiler, Steam turbine and all associated utility systems.</p> <p>The existing power plant will be recommissioned / modified / rebuilt to have the capability to use natural gas and/or, process off-gases and/or naphtha as fuels. No additional capacity is proposed.</p>	Modelling Assessment.		
Non-SAF Plant Emissions					
-	Conveying Corridors	Multiple internal conveyors for connection to feedstock processing, storage areas, SAF plant and rail/freight facility	--	Particulate matter suspended during Biocarbon Feedstock transfer.	Operational Phase Fugitive Dust
-	Rail Terminal and Rail Line Emissions	Emissions from diesel trains for delivery of Biocarbon Feedstock.	--	Fuel combustion (NO _x , PM ₁₀ and PM _{2.5}) emissions from Biocarbon Feedstock import and product export.	Rail Traffic (NO ₂ , PM ₁₀ and PM _{2.5})

ID	Component	Description	“Associated Equipment (AE)”, e.g. Columns and/or Stacks. *	Emission Source	Assessment Methodology
-	Road Traffic Emissions	Emissions from on-road construction and operational phase vehicles, including use of the Heavy Haul Road	--	Fuel combustion (NO _x , PM ₁₀ and PM _{2.5}) emissions from employee and support vehicles.	Road Traffic (NO ₂ , PM ₁₀ and PM _{2.5})

Note: -- These are indicative parameters which will be confirmed at ES stage.

SENSITIVE RECEPTORS

Human Receptors

- 5.5.5. The following discrete locations have been identified as areas where people might be present for a period of time commensurate with the limit and objective values³² for air pollutants within a 2km radius of the DCO Application Boundary. The locations are provided with distances specified in relation to the Site Boundary^a.
- 5.5.6. The SAF Plant is located within the DCO Application Boundary, and as such the distances presented are worst-case distances from the SAF Plant to potential human receptors. The distances are relevant to all activities within the Site Boundary.
- Residential properties within 2km, including:
 - Port Clarence (directly adjacent to the Heavy Haul Road and 50m from Wilton Engineering Wharf);
 - Dormanstown (approximately 300m from the Bran Sands WWTP utilities connections);
 - Middlehaven (approximately 500m from the Heavy Haul Road and Wilton Engineering Wharf);
 - Middlesbrough (approximately 900m);
 - North Ormesby (approximately 1,200m);
 - Cowpen Bewley (approximately 1,400m);
 - Southfield (approximately 1,700m);
 - Grangetown (approximately 1,700m);

^a Note that the Site Boundary referred to is version 17.

- South Bank (approximately 1,800m); and
- Gresham (approximately 1,800m).
- Educational facilities within 2km, including:
 - High Clarence Primary School (approximately 170m from the Heavy Haul Road and 80m from Wilton Engineering Wharf);
 - ESPA College (approximately 320m);
 - Middlesbrough College (approximately 500m);
 - Dormanstown Primary Academy (approximately 600m);
 - North Ormesby Primary Academy (approximately 1,100m);
 - Great Expectations Pre-School (approximately 1,300m);
 - St Alphonsus R C Primary School (approximately 1,400m);
 - Breckon Hill Primary School (approximately 1,500m);
 - Abingdon Primary School (approximately 1,500m);
 - Teesside University (approximately 1,600m);
 - Outwood Academy Redcar (approximately 1,700m); and
 - Newcomen Primary School (approximately 1,800m).
- Medical Facilities within 2km, including:
 - The Bridge Elysium Healthcare (approximately 500m);
 - Cleveland Health Centre (approximately 1,100m);
 - North Ormesby Health Village (approximately 1,200m);
 - Haven Medical Practice (approximately 1,400m);
 - Newlands Medical Centre (approximately 1,400m);
 - Borough Road & Nunthorpe Medical Group (approximately 1,400m);
 - Park Surgery (approximately 1,700m); and
 - The Eston Surgery (approximately 1,800m).

5.5.7. The list of residential, educational and medical facilities is non-exhaustive and may be modified as the project design evolves.

5.5.8. A regular receptor grid will be used to determine potential human exposure further from the Site.

5.5.9. The Study Areas for the assessment are described in **Section 5.5**. There are no Air Quality Management Areas (AQMAs) within the 2km Study Area for specified receptors, and none within the further 10km Study Area covered by the regular receptor grid.

Ecological Receptors

5.5.10. For ecological receptors, Environment Agency²³ guideline screening distances (applied from the Site Boundary) have been applied for the identification of sensitive receptors,

which requires that the following sites be identified for the assessment of air quality impacts:

- Special Protection Area (SPA), Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI) and Ramsar sites within 15km of the Site Boundary; and
- National and Local Nature Reserves (LNR), Ancient Woodland (AW) and Local Wildlife Sites (LWS) within 2km of the Site Boundary.

5.5.11. Relevant ecological receptors identified within the 15km Study Area (described in **Section 5.5**) have been determined from Natural England Datasets³³. The following designated sites are included in the assessment with reference to the distance of the site to the nearest point of the Site Boundary:

- Teesmouth and Cleveland Coast SPA, SSSI, Ramsar which is directly adjacent to the Site Boundary;
- North York Moors SPA, SAC, SSSI (approximately 10km);
- Northumbria Coast SPA, Ramsar (approximately 13.8km);
- Durham Coast SAC, SSSI (approximately 13.8km);
- Briar Croft Pasture SSSI (approximately 10.1km);
- Hart Bog SSSI (approximately 12.2km);
- Hulam Fen SSSI (approximately 14.6km);
- Lovell Hill Pools SSSI (approximately 5.2km);
- Pike Whin Bog SSSI (approximately 12.3km);
- Saltburn Gill SSSI (approximately 9.6km); and
- Whitton Bridge Pasture SSSI (approximately 10.4km).

5.5.12. Within 2km of the Proposed Scheme there are no sites on the AW inventory. Two LNR sites and four LWS have been identified, as listed below with reference to the distance of the site to the nearest point of the Site Boundary:

- Berwick Hills LNR (approximately 1.7km);
- Cowpen Bewley Woodland Country Park LNR (approximately 1.6km);
- Berwick Hills and Ormesby Beck Complex LWS (approximately 1.8km);
- Greatham Creek North Bank Saltmarsh LWS (approximately 1.6km);
- Greenabella Marsh LWS (approximately 1.7km); and
- Teesaurus Park LWS (approximately 0.7km).

5.5.13. The list of designated sites will be reviewed at the ES stage in line with any further changes to the Site Boundary.

5.5.14. The designated sites assessed for air quality impacts are indicated in **Table 5-7**.

5.5.15. Further details of the designated sites can be found in **Chapter 7: Terrestrial Ecology (Volume 1)**, **Chapter 8: Freshwater and Marine Ecology (Volume 1)** and **Appendix 5A: Designated Sites (Volume 3)**.

BASELINE DATA COLLECTION

- 5.5.16. The key sources of information used to determine the baseline air quality conditions are:
- National pollutant concentration mapping for nitrogen oxides and particulate matter, available from the DEFRA website³⁴;
 - National pollutant concentration data for ammonia and sulphur dioxide, and deposition mapping for nitrogen and acid, available from UK Centre for Ecology & Hydrology Air Pollution Information System (APIS)³⁵;
 - LAQM monitoring and reporting from Local Authorities including Stockton-on-Tees Borough Council (STBC)^{36, 37, 38}, Middlesbrough Borough Council (MBC)^{39, 40}, and Redcar and Cleveland Borough Council (RCBC)^{41, 42, 43};
 - UK's national monitoring networks, managed by the Environment Agency on behalf of DEFRA and the Devolved Administrations, with data available from DEFRA's UK Air Information Resource Website⁴⁴;
 - The Multi Agency Geographic Information for the Countryside (MAGIC)⁴⁵; and
 - Proposed Scheme specific air quality monitoring undertaken by WSP on behalf of the Applicant (as detailed in **Section 5.10**).

CONSTRUCTION PHASE ASSESSMENT METHODOLOGY

Construction Phase Fugitive Dust

- 5.5.17. For the assessment of Construction Phase fugitive dust emissions, it has been assumed that all construction activities will occur across the entire Site. This is a precautionary approach because in reality, activities will be confined to limited discrete areas within the Site.
- 5.5.18. Activities in the Construction Phase of the Proposed Scheme may result in the generation of fugitive dust emissions which, if transported beyond the Site, can have adverse impacts on local air quality.
- 5.5.19. Dust comprises of particles typically sized between 1-75 micrometres (μm) in aerodynamic diameter. Dust is created through the action of crushing and abrasive force on materials. Larger dust particles typically fall out of the atmosphere quickly after the initial release and therefore tend to be deposited on surfaces in relative proximity to the source of the dust emission. As such, dust is unlikely to cause widespread or long-term changes to local air quality, but its deposition on property can cause "soiling". This may result in nuisance complaints through amenity loss or perceived damaged caused, which is usually temporary.
- 5.5.20. The smaller particles of dust (not exceeding $10\mu\text{m}$ in aerodynamic diameter) are known as PM_{10} and represent only a small proportion of the total dust released. Within PM_{10} there is a finer fraction, known as $\text{PM}_{2.5}$ (with an aerodynamic diameter not exceeding $2.5\mu\text{m}$).
- 5.5.21. PM_{10} and $\text{PM}_{2.5}$ are the smaller end of the size range of dust particles and can remain suspended in the atmosphere for a longer period of time than larger particles and,

therefore, can be transported by wind over a wider area. PM₁₀ and PM_{2.5} are small enough to be drawn into the lungs during respiration, which can have a potential impact on the health of sensitive members of the public. However, ambient dust emissions from construction activities will be as PM₁₀ and predominantly in the coarse fraction (PM_{2.5-10}) rather than in the PM_{2.5} fine particle fraction¹⁹. As such, the Construction Phase dust assessment focuses on levels of PM₁₀ with respect to human receptors.

- 5.5.22. An assessment of the likely significant impacts on local air quality due to the generation and dispersion of dust and PM₁₀ during the Construction Phase has been undertaken with reference to the IAQM Construction Dust¹⁹ guidance, the available information for this phase of the Proposed Scheme and professional judgement.
- 5.5.23. The IAQM Construction Dust¹⁹ guidance methodology assesses the risk of potential dust and PM₁₀ impacts from the following four sources:
- Demolition: any activity involved with the removal of any existing structures;
 - Earthworks: the processes of soil-stripping, ground-levelling, excavation and landscaping;
 - Construction: any activity involved with the raising of a new structure(s) (including building, road, etc.), its modification or refurbishment; and
 - Track-out: the transport of dust from a site onto the public road network where it may be deposited and subsequently re-suspended by vehicles using the network. Track-out arises when heavy duty vehicles (HDV) leave a site with dusty materials which may then spill onto the road, and/or when HDV transfer dust onto the road network after travelling within a site.
- 5.5.24. The IAQM Construction Dust¹⁹ guidance methodology takes into account the nature and scale of the activities undertaken for each source and the sensitivity of the area to an increase in dust and PM₁₀ levels to assign a level of risk. Risks are described in terms of there being a low, medium or high risk of dust impacts. Once the level of risk has been ascertained, then site specific mitigation proportionate to the level of risk is identified, and the significance of residual effects determined. A summary of the IAQM Construction Dust¹⁹ guidance methodology is provided in **Appendix 5B: Construction Phase Dust Assessment (Volume 3)**.

Non-Road Mobile Machinery (NO₂, PM₁₀ and PM_{2.5})

- 5.5.25. In addition to impacts on local air quality from fugitive dust due to onsite construction activities, exhaust emissions from construction vehicles and plant may have an impact on local air quality adjacent to the routes used by these vehicles to access and egress the Site and in the vicinity of the Site itself. A qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:
- The number and type of construction traffic and plant likely to be required (information by the construction traffic information presented in **Chapter 16: Traffic and Transport (Volume 1)**);

- The number and proximity of sensitive receptors to the Site and along the likely routes to be used by construction vehicles; and
- The likely duration of the Construction Phase (from Q4 2025 to Q3 2028) and the nature of the construction activities undertaken (informed by the indicative construction programme and construction activities described in **Chapter 2: Site and Proposed Scheme Description (Volume 1)**).

Road Traffic (NO₂, PM₁₀ and PM_{2.5})

Construction Phase Road Traffic Screening

5.5.26. **Chapter 16: Traffic and Transport (Volume 1)** presents a peak estimate of road traffic movements to/from the Proposed Scheme during the Construction Phase. As part of the design evolution a profile of road traffic movements to/from the Proposed Scheme for each year of the Construction Phase has been developed.

5.5.27. Following guidance in the Design Manual for Road Bridges (DMRB) LA 105²⁰, construction traffic would be considered to be short-term and transient where the Construction Phase is anticipated to be less than two years in duration. As construction is anticipated to last three years, the traffic flows are screened against the DMRB thresholds of AADT (annual average daily traffic) in **Table - 5-4**.

Table - 5-4 - DMRB Construction Traffic Screening Criteria

Vehicle Class	DMRB Screening Threshold (AADT)
All vehicles (LDVs ⁱ and HDVs ⁱⁱ)	1000
HDVs ⁱⁱ	200
ⁱ Light Duty Vehicle (cars and small vans 2.5t gross vehicle weight) ⁱⁱ Heavy Duty Vehicle (goods vehicles and buses >2.5t gross vehicle weight)	

5.5.28. The peak estimates of road traffic movements to/from the Proposed Scheme during the Construction Phase (60 HDV movements per day) in **Chapter 16: Traffic and Transport (Volume 1)** have been screened against the criteria in **Table - 5-4**. Further details on the screening methodology can be found in **Appendix 5D: Road Traffic Modelling Assessment (Volume 3)**.

5.5.29. For HDVs, the peak estimates are below the screening criteria on all relevant road links. However, the peak estimates of LDVs during the Construction Phase exceed the 1000 AADT screening criteria along the following road links:

- Seaton Carew Road (A178) from Huntsman Drive to Port Clarence Road;
- Port Clarence Road (A1046) from the A178 to Hope Street; and
- Haverton Hill Road (A1046) from Hope Street to New Road.

5.5.30. The road links listed above are therefore the ‘Affected Road Network’ (ARN) for the Construction Phase and are shown in **Figure 5-13 (Volume 2)**. The impact of road traffic emissions on air quality has been assessed for the Modelled Road Network,

which includes those road links where traffic flows in the Construction and/or Operational Phase exceed the relevant screening criteria (the ARN for the Construction and Operational Phases combined). The Modelled Road Network has been assessed with a detailed atmospheric dispersion model in the methodology outlined below.

5.5.31. The screening will be revisited at the ES stage with updated design information and an updated detailed assessment will be undertaken, if required.

Construction Road Traffic Modelling Methodology

5.5.32. Complex atmospheric dispersion modelling has been completed with the ADMS Roads v5.0 dispersion model⁵⁰, which has been widely validated for this type of assessment and is considered to be fit for purpose. The following scenarios have been modelled:

- Model verification and baseline (2024);
- 2026 Do Minimum (DM) (without construction traffic); and
- 2026 Do Something (DS) (with construction traffic).

5.5.33. For the PEIR assessment, specific monitoring data for the Proposed Scheme is not available. However, monitoring is currently being undertaken in the study area, which will be used to verify the model at the next stage of assessment. 2024 traffic data was used for the baseline assessment to match the monitoring data when available. 2023 meteorological data was used as this is the most recent year for which data are available. 2026 is the assessed year of the Construction Phase of the Proposed Scheme.

5.5.34. To determine the air quality impacts of the Proposed Scheme, the model was used to predict road traffic emissions contributions to concentrations of:

- NO₂, PM₁₀ and PM_{2.5} at human receptors; and
- NO_x, NH₃ and nitrogen deposition at ecological receptors.

5.5.35. The road traffic data used in the assessment were provided by WSP transport. Data were provided as AADT flows, vehicle speeds (km/h) and the percentage of HDVs for the local road network in all assessment years considered.

5.5.36. Vehicle emission factors for NO_x, PM₁₀ and PM_{2.5} were calculated using the most recent Emissions Factors Toolkit (EFT V12.0)⁴⁶ available from Defra.

5.5.37. Background concentration data for NO_x, NO₂, PM₁₀ and PM_{2.5} was obtained from Defra's background mapping⁵⁴, where background concentrations of those pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. Estimated concentrations are available for all years between 2018 and 2030. For NO_x, NO₂, PM₁₀ and PM_{2.5}, the background maps present both the 'total' estimated background concentrations and the individual contributions from a range of emission sources (for example, motorways, aircraft, domestic heating etc.). When detailed modelling of an individual sector is required as part of an air quality assessment, the respective contribution can be subtracted from the overall background estimate to avoid the potential for 'double-counting'. For this assessment, the traffic data includes the majority of the main A-Roads and trunk roads within the grid squares that make up the

study area. Therefore, contributions from these sectors have been removed from the background concentrations where appropriate.

- 5.5.38. Meteorological data, such as wind speed and direction, is used by the model to determine pollutant transportation and levels of dilution by the wind. Meteorological data was sourced for the year 2023 from a Numerical Weather Prediction (NWP) model to represent local pollutant dispersion conditions.
- 5.5.39. To determine the performance of the model, a comparison of modelled results with the results of monitoring carried out within the study area would normally be undertaken. This process of verification aims to minimise modelling uncertainty and systematic error by correcting modelled predictions by an adjustment factor to provide confidence in the final results. In this instance, the scheme-specific air quality monitoring is still ongoing, and monitoring undertaken by Local Authorities is not within the vicinity of the modelled roads. Therefore, a precautionary adjustment factor of 3.0 has been applied. This is a precautionary approach as the monitoring derived adjustment factor is likely to be lower. Once scheme-specific air quality monitoring is completed, a bespoke adjustment factor will be determined and updated results reported in the ES.
- 5.5.40. Following the application of the adjustment factor to the modelled road-NO_x outputs, annual mean NO₂ concentrations were calculated using the latest NO_x to NO₂ calculator (version 8.1, released August 2020) provided by Defra. Model verification and results processing was completed in accordance with the methodology outlined in LAQM TG(22)²². Further details are provided in **Appendix 5D: Road Traffic Modelling Assessment (Volume 3)**.
- 5.5.41. Paragraph 7.97 of LAQM.TG(22) advises that exceedances of the 1-hour mean NO₂ objective are unlikely to occur where annual mean concentrations are below 60µg/m³, and it provides guidance on the approach that should be taken if either measured or predicted annual mean NO₂ concentrations are 60µg/m³ or above. The 60µg/m³ criterion has been adopted in the completion of the assessment.

Assessment of Impacts on Ecological Receptors

- 5.5.42. The impact of the Proposed Scheme on annual mean NO_x concentrations, ammonia concentrations, and on levels of nutrient nitrogen deposition within the identified designated sites has been assessed with reference to guidance published by the IAQM²⁴ and Natural England⁴⁷ as appropriate.
- 5.5.43. The NH₃ emission rates were calculated using Air Quality Consultants Ltd's 'Calculator for Road Emissions of Ammonia' (CREAM V1A)⁴⁸, which works in a similar way to the EFT and takes into account fleet composition data and projections from the National Atmospheric Emissions Inventory (NAEI) to estimate NH₃ emissions for all years between 2013 and 2035.
- 5.5.44. Background nitrogen deposition rates and NH₃ concentrations for the OS grid squares within which the designated sites are located were obtained from the APIS website, where deposition rates have been mapped for the whole of the UK. Deposition rates are currently available for a three-year averaging period (2019-2021), which are the latest data available. The nutrient nitrogen deposition rates and NH₃ concentrations were then

projected to assessment year (2026) based on the trend data provided within the Joint Nature Conservation Committee (JNCC) Nitrogen Futures report, which suggests there will be:

- A reduction in Nutrient Nitrogen Deposition rates of 1.04% per year; and
- An increase in NH₃ concentrations of 0.08% per year.

5.5.45. To calculate the predicted total nitrogen deposition rates at each receptor point, the modelled road-NO_x concentrations were converted to road-NO₂ concentrations using Defra's NO_x to NO₂ calculator. The road-NO₂ contributions and NH₃ concentrations were then converted to a road dry nutrient nitrogen deposition rate using the conversion rates for forests / tall vegetation summarised below, which have been taken from the Environment Agency AQTAG²⁵ guidance, before being combined and added to the relevant background deposition rate.

- For nutrient nitrogen deposition:
 - a) For grassland and similar habitats – 0.0015m/s
 - b) For forests and tall vegetation – 0.003m/s
- For NH₃ deposition:
 - a) For grassland and similar habitats – 0.02m/s
 - b) For forests and tall vegetation – 0.03m/s.

5.5.46. The total deposition rates were then compared to the habitat specific critical loads for each designated site, which are summarised in **Table 5-7**.

Selection of Sensitive Receptors

Human Health Receptors

5.5.47. To complete the assessment of operation phase impacts, pollutant concentrations were predicted at sensitive receptors located within 200m of the ARN. Sensitive receptors include locations where members of the public will be regularly present for period of time prescribed in the AQS, and primarily included residential dwellings and schools. Box 1.1 of LAQM.TG(22)²² provides examples of the locations where the air quality objectives should/should not apply. Because of the number of receptors in the study area, all human receptors were modelled at a representative breathing height of 1.5m. The assessment receptors are shown in **Figure 5-13 (Volume 2)**.

Ecological Receptors

5.5.48. LA 10520 and IAQM24 guidance defines the types of ecological site that may require consideration of air quality impacts. The following ecological receptors were identified within 200m of the ARN and included in the assessment:

- Teesmouth and Cleveland Coast SPA, Ramsar, SSSI; and
- Cowpen Bewley Woodland Country Park LNR.

5.5.49. For the ecological receptors identified above, concentrations of NO_x, NH₃, and nitrogen deposition rates were modelled at selected receptor points closest to the ARN. For the purposes of determining the in-combination impact of the Proposed Scheme, a

receptor grid matching that discussed in Section 5.4 is placed across the designated sites within 200m of the ARN. Concentrations were predicted at ground level (0m).

- 5.5.50. Nitrogen deposition rates and critical loads have been obtained using the site relevant critical load tool from APIS³⁵ for the grid squares in which the modelled transects are located.
- 5.5.51. The ecological receptors assessed are shown in **Figure 5-13 (Volume 2)**.

OPERATIONAL PHASE ASSESSMENT METHODOLOGY

Operational Phase Fugitive Dust

- 5.5.52. A preliminary, qualitative assessment of potentially significant dust sources has been completed (**Section 5.8**) with reference to the IAQM Minerals Dust Guidance²¹ to determine best practice measures to control fugitive emissions. The ES will build on this assessment using evolved design information to determine definitive measures to inform the project Environmental Management Plan.

SAF Plant Atmospheric Dispersion Modelling

- 5.5.53. Point-source process emissions in the SAF plant have been quantitatively assessed using the ADMS v6.0⁵⁰ atmospheric dispersion model. The model has been validated against both field studies and wind tunnel studies of dispersion and is widely used for air quality impact assessment in the UK.
- 5.5.54. The atmospheric dispersion model considers the effects of terrain, roughness length (with respect to land use) and buildings (as appropriate for the location), together with, in accordance with Environment Agency guidance⁴⁹, five years of representative meteorological data.
- 5.5.55. The air pollutants assessed as part of the Operational Phase air quality assessment comprise:
- Oxides of nitrogen (NO_x and NO₂);
 - Particulate matter (Dust deposition, PM₁₀ and PM_{2.5});
 - Sulphur oxides (SO_x and SO₂);
 - Carbon monoxide (CO); and
 - Unburned hydrocarbons (UHC).
- 5.5.56. UHC will consist of a range of methane and non-methane based hydrocarbons to be determined at the ES stage. As a preliminary and precautionary approach, UHC has been assessed as a single pollutant and assessed against AQAL for related hydrocarbon species benzene (**Table 5-6**).
- 5.5.57. Details of the adopted atmospheric dispersion modelling approach are provided in **Appendix 5C: Point Source Modelling Assessment (Volume 3)**. However, key information relating to the dispersion modelling methodology is summarised in the subsections below.

Modelled Scenarios

- 5.5.58. Preliminary modelling of the SAF Plant has been undertaken based on the current design information available. The air quality assessment for the Operational Phase of the Proposed Scheme at this stage of the assessment has focused on the following scenario:
- With Proposed Scheme - operation of the SAF Plant with the following sources:
 - Caustic Scrubber vent;
 - Auxiliary boiler stack;
 - HP start-up flare;
 - FT emission via the LLP flare; and
 - Existing CCGT plant, comprising two gas turbine and auxiliary boiler stacks.
- 5.5.59. The assessment will be revisited at the ES with evolved design information and the modelling assessment will be expanded, if necessary, to include further sources within the SAF Plant.
- 5.5.60. The impact of the Proposed Scheme has been assessed following the UK Government guidance 'Air emissions risk assessment (AERA) for your permit' guidance²³. The AERA guidance allows the screening out as insignificant any pollutants where the Process Contribution (PC) (i.e., the pollutant concentration resulting from the Proposed Scheme) is less than 10% of the short-term environmental standard and less than 1% of the long-term standard.
- 5.5.61. Where the PC is not screened out, the Predicted Environmental Concentration (PEC) (i.e., the PC plus background concentration or deposition) is calculated and compared to the AQAL. Baseline conditions (determined from Local Authority and scheme-specific air quality monitoring and sourced from Defra Background Mapping).

Model Parameters

- 5.5.62. The model parameters for the SAF Plant are provided in **Appendix 5C: Point Source Modelling Assessment (Volume 3)**. The source emissions, stack and building parameters are based on information from the most recent design evolution. Stack heights for the LLP flare and HP flare have been calculated following ADMS modelling guidance⁵⁰, details of which may be found within **Appendix 5C: Point Source Modelling Assessment (Volume 3)**.
- 5.5.63. The sources in the SAF Plant were modelled as continuously emitting points and flares, with the exception of the HP start-up flare which will operate for a period of two-weeks as required. The HP start-up flare was modelled separately as a continuous emission source with the maximum prediction, corresponding to the poorest pollutant dispersion conditions, included in the assessment of hourly-mean impacts only. This is a precautionary approach because the use of the HP flare may not correspond to the worst-case pollutant dispersion conditions. The FT emission via the LLP flare was modelled as a continuous emission.

5.5.64. The auxiliary boiler and turbines have been modelled at the exit concentration limits for NO_x, CO and UHC in the Directive, and as such provides a conservative assessment of emissions. Furthermore, the mass emission estimate of each source has been increased by 10% to provide additional precaution in the assessment results.

Model Outputs

5.5.65. The processed model outputs comprise concentration data for each pollutant and the respective short term (e.g. 15min, hourly, daily) and long term (annual) averaging periods at all gridded receptor locations (human and ecological). These outputs are provided for each of the modelled five years (2019-2023 inclusive), thereby allowing the maximum value at each receptor to be reported over this period. The relevant averaging periods specific to each assessed pollutant are provide in **Table 5-6** for human receptors and **Table 5-7** for ecological receptors.

5.5.66. In addition to modelling concentrations of each pollutant, the assessment of nutrient nitrogen deposition and acid deposition at identified sensitive ecological habitats, associated with emissions from each modelled scenario, has adhered to Environment Agency guidance⁴⁹.

5.5.67. Background pollution and nitrogen/acid deposition levels for each relevant compound, where available, have been obtained from national mapping data provided by Defra³⁴³⁴ and the Air Pollution Information System (APIS)³⁵ for human and ecological receptors respectively. These are reported in **Section 5.5**.

5.5.68. The quantified impacts associated with the PC and the PEC have been assessed in relation to the following standards:

- Statutory ambient air quality standards for both human and ecological receptors (see **Section 5.1**);
- Non-statutory EAL set by the Environment Agency (**Section 5.1**); and
- Non-statutory critical levels and critical loads for ecological receptors, taken from the APIS website³⁵ (see **Table 5-7**).

5.5.69. This assessment has accounted for the PC and PEC relating to the operational SAF Plant and the 'in-combination' effect of road traffic and the SAF plant. Assessed impacts represent the change in concentration/deposition between the Proposed Scheme scenario PC and the baseline air quality conditions (determined from Local Authority and scheme-specific air quality monitoring and sourced from Defra Background Mapping). The assessment of cumulative impacts, whereby the PC from the Proposed Scheme is added to relevant PC from qualifying developments within the Study Area will be presented in the ES.

Road Traffic (NO₂, PM₁₀ and PM_{2.5})

Operational Phase Road Traffic Screening

5.5.70. **Chapter 16: Traffic and Transport (Volume 1)** presents an estimate of road traffic movements to/from the Proposed Scheme during the Operational Phase. These traffic estimates have been screened against IAQM/EPUK¹⁸ guidance to determine whether a quantitative assessment is required.

5.5.71. As there is no AQMA within 2km of the Proposed Scheme, the following IAQM/EPUK Planning guidance criteria has been used for the screening of operational traffic flows:

- A significant change of more than 500 AADT on local roads with relevant receptors; and
- A significant change of more than 100 HDVs AADT on local roads with relevant receptors.

5.5.72. The road traffic flow estimates for the Operational Phase of the Proposed Scheme are below the screening criteria of a 500 AADT change on all relevant road links. However, the worst-case estimates of HDVs exceed the 100 AADT screening criteria along the following road links:

- Seaton Carew Road (A178) from Huntsman Drive to Seal Sands Roundabout;
- A1185 from Seal Sands Roundabout to Wolviston Road;
- A689 between Wolviston Road and Wolviston Interchange; and
- A19 north from Wolviston Interchange.

5.5.73. The road links listed above are the ARN for the Operational Phase and are shown in **Figure 5-13 (Volume 2)**. Further details on the screening methodology can be found in **Appendix 5D: Road Traffic Modelling Assessment (Volume 3)**.

5.5.74. For the purpose of road traffic modelling, the impact of road traffic emissions on air quality has been assessed for the Modelled Road Network as a single model. This includes those road links where traffic flows in the Construction and/or Operational Phases exceeds the relevant screening criteria i.e. the ARN for the Construction and Operational Phases combined.

5.5.75. The methodology for the Operational Phase modelling is the same as the Construction Phase, except for the modelling of the following scenarios:

- Model verification and baseline (2024);
- 2028 Do Minimum (DM) (without Proposed Scheme); and
- 2028 Do Something (DS) (with Proposed Scheme).

5.5.76. The screening will be revisited at the ES with updated design information and an updated detailed assessment will be undertaken, if required.

Rail Transport (NO₂, PM₁₀, PM_{2.5}, SO₂)

5.5.77. The impact of locomotive emissions will be assessed following the guidance provided in paragraphs 7.21 to 7.22 of LAQM.TG(22))²². The detailed design information provided at the ES stage will be screened against the following criteria:

- Stationary diesel or steam locomotives:
 - Identify locations where diesel or steam locomotives are regularly (at least three times a day) stationary for periods of 15-minutes or more; and
 - Determine relevant exposure within 15m of the locomotives.
- Moving diesel locomotives:

- Determine relevant exposure within 30m of the relevant railway lines that are included in Table 7-2 of LAQM.TG(22); and
- Identify whether the background annual mean NO₂ concentration is above 25µg/m³ in these areas.

5.5.78. Where the screening criteria are met, detailed dispersion modelling will be completed following a methodology adapted from the assessment of road transport emissions.

In-Combination Operational Assessment

- 5.5.79. An in-combination impact assessment of the operation of the Proposed Development has been undertaken, where the long-term impacts of the operation of the SAF Plant and the operational traffic movements have been summed together. In this preliminary assessment, the in-combination impact of the operational road traffic emissions and the operation of the SAF Plant has been determined for the residential receptors used in the road traffic detailed dispersion modelling.
- 5.5.80. It should be noted that maximum predictions of all pollutants for operational phase road traffic and the operational SAF plant are not located at the same position within the model domain and as such are mutually exclusive. Therefore, this in-combination maximum is not reported.
- 5.5.81. Operational phase in-combination impacts will be reviewed at the ES stage when updated design information on road traffic and SAF emissions is available and screening of rail and marine sources has been completed.
- 5.5.82. The in-combination impact of the Operational Phase of the Proposed Scheme at these receptor locations can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

SIGNIFICANCE CRITERIA

Construction Phase

- 5.5.83. The matrix for determining risk for the construction dust assessment is shown in **Appendix 5B: Construction Phase Dust Assessment (Volume 3)**. Risk is determined by the magnitude of impact (degree of change) and sensitivity of the receptor. For almost all construction activity, the aim is to prevent significant effects on receptors through effective mitigation. This is nearly always possible and so the residual effect is normally 'not significant' in accordance with the IAQM Construction Dust guidance¹⁹.
- 5.5.84. For road traffic emissions, the IAQM/EPUK Planning guidance¹⁸ and methodology to determine significance applied in the Operational Phase assessment are also applied to Construction Phase. Emissions from locomotives and marine vessels have not been assessed at this stage of the preliminary design. If these emission sources are scoped in to quantitative assessment in the ES, the same guidance and methodology will apply.

Operational Phase

Human Receptors

5.5.85. For long term (annual mean) pollutant concentrations, the IAQM/EPUK Planning guidance¹⁸ recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant Air Quality Assessment Level (AQAL) and examining this change in the context of the new total concentration and its relationship with the assessment criterion. This is summarised in **Table 5-5**.

Table 5-5: Air Quality Impact Descriptors Relating to Individual Receptors (Human)

Long term Average Concentration at Receptors in Assessment Year	% Change in Concentration Relative to AQAL			
	1	2-5	6-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 – 94% AQAL	Negligible	Slight	Moderate	Moderate
95 – 102 of AQAL	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

- **AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives and non-statutory Environmental Assessment Levels (EAL)s for human health.**
- **Where the % change in concentrations is <0.5%, the change is described as ‘negligible’ regardless of the concentration. For this assessment, this is interpreted as a %change <1.0% (rounded to 1dp) for compatibility with Environment Agency guidance²⁵.**
- **When defining the concentration as a percentage of the AQAL, ‘without scheme’ (baseline) concentration should be used where there is a decrease in pollutant concentration and the ‘with scheme’ (Proposed Scheme) concentration where there is an increase.**
- **Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.**

5.5.86. The IAQM/EPUK Planning guidance impact descriptors²⁴ are used as the starting point to make a judgement on the significance of effects, since other impacts/effects may be important. The IAQM/EPUK Planning guidance²⁴ states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including the:

- Existing and future air quality in the absence of the Proposed Scheme;
- Extent of current and future population exposure to the impacts; and
- Influence and validity of any assumptions adopted when undertaking the prediction of impacts.

5.5.87. The IAQM/EPUK guidance²⁴ states that for most road transport related emissions, long term average concentrations are the most useful for evaluating the severity of impacts. For short term (sub-hourly, hourly and daily averages) pollutant concentrations from sources such as point sources in the SAF Plant, the IAQM/EPUK guidance²⁴ recommends that the impact is described with reference to the magnitude of the impact from the PC without consideration of the background concentrations. This assumes that the background concentrations will be smaller than the peak concentrations caused by a substantial plume.

5.5.88. The description of the impacts for short-term pollutants is determined as follows:

- Where the impact is ≤10% of an Air Quality Assessment Level (AQAL), it is described as negligible;
- Where the impact is 11-20% of an Air Quality Assessment Level (AQAL), it is described as slight;
- Where the impact is 21-50% of an Air Quality Assessment Level (AQAL), it is described as moderate; and
- Those impacts that are ≥51% of an Air Quality Assessment Level (AQAL) are described as substantial.

5.5.89. Both long-term and short-term average concentrations will be considered to judge likely significant effects.

5.5.90. The AQALs for the assessment, shown in **Table 5-6**, are derived from UK air quality regulations¹⁴ or, where statutory standards do not exist, the Environment Agency EALs⁴⁹.

Table 5-6: Air Quality Assessment Levels for Human Health

Pollutant	Averagin g Period	Concentration (µg/m ³)	Permitted Exceedances per Year	Statutory
NO ₂	1 hour	200	18	a
	Annual	40	-	a
PM ₁₀	Daily	50	35	a
	Annual	40	-	a
SO ₂	15 minute	266	36	a
	1 hour	350	18	a
	24 hour	125	3	a
CO	8 hour	10,000	-	a
Benzene	Annual	5	-	a

Ecological Receptors

5.5.91. Following Environment Agency guidance²⁵, impacts will be screened against the following criteria for the SPA, SAC, SSSI and Ramsar ecological receptors under assessment:

- The short-term PC is less than 10% of the short-term environmental standard for the ecological receptor; and
- The long-term PC is less than 1% of the long-term environmental standard for the ecological receptor.

5.5.92. If the above criteria are not met, additional criteria are applied as follows:

- If the short-term PC exceeds the above screening criteria, significant effects cannot be screened out and further assessment is needed; or
- If the long-term PC is greater than 1% and the PEC is less than 70% of the long-term environmental standard, the emissions are insignificant and no further assessment is required; or
- If the PEC is greater than 70% of the long-term environmental standard, significant effects cannot be screened out and further assessment is needed.

5.5.93. For local nature sites (including LWS and LNRs), impacts will be screened against the following criteria, following Environment Agency guidance²⁵:

- The short term PC is less than 100% of the short term environmental standard for protected conservation areas; and
- The long term PC is less than 100% of the long term environmental standard for protected conservation areas.

5.5.94. If the above criteria are met, significant effects can be screened out.

5.5.95. The significance of effects on ecological receptors is assessed within **Chapter 7: Terrestrial Ecology (Volume 1)** and **Chapter 8: Freshwater and Marine Ecology (Volume 1)** (where required).

5.5.96. The assessment standards for ecological receptors are set out in **Table 5-7** below. For SO₂, NH₃ and nitrogen and acid deposition, the assessment standards are habitat, and hence designated site, specific.

Table 5-7: Air Quality Assessment Levels for Ecological Receptors

Designation	Name	NO_x Annual Mean Critical Level (CL_e) (µg/m³)	NO_x Daily Mean Critical Level (CL_e) (µg/m³)	SO₂ Annual Mean Critical Level (CL_e) (µg/m³)	NH₃ Annual Mean Critical Level (CL_e) (µg/m³)	N-Deposition Annual Mean Critical Load (CL_o) (kgN/ha/yr)	Acid Deposition Annual Mean (CL_{max}N) Critical Load (CL_o) (keq/ha/yr)
SPA, SSSI, Ramsar	Teesmouth & Cleveland	30	75	-	3	5	4.856
SPA, SAC, SSSI	North York Moors	30	75	10	1	5	0.504
SAC, SSSI	Durham Coast	30	75	10	1	5	4.856
SPA, Ramsar	Northumbria Coast	30	75	-	3	5	1.062
SSSI	Briar Croft Pasture	30	75	20	3	10	5.071
SSSI	Hart Bog	30	75	10	1	5	0.469
SSSI	Hulam Fen	30	75	20	1	15	-
SSSI	Lovell Hill Pools	30	75	20	3	-	-
SSSI	Pike Whin Bog	30	75	10	1	5	-
SSSI	Saltburn Gill	30	75	10	1	15	2.639
SSSI	Whitton Bridge Pasture	30	75	20	3	10	5.071
LNR	Berwick Hills	30	75	-	1	10	-
LNR	Cowpen Bewley Woodland Country Park	30	75	-	1	10	-

Designation	Name	NO _x Annual Mean Critical Level (CLe) (µg/m ³)	NO _x Daily Mean Critical Level (CLe) (µg/m ³)	SO ₂ Annual Mean Critical Level (CLe) (µg/m ³)	NH ₃ Annual Mean Critical Level (CLe) (µg/m ³)	N-Deposition Annual Mean Critical Load (CLo) (kgN/ha/yr)	Acid Deposition Annual Mean (ClmaxN) Critical Load (CLo) (keq/ha/yr)
LWS	Berwick Hills and Ormesby Beck Complex	30	75	-	1	10	-
LWS	Greatham Creek North Bank Saltmarsh	30	75	-	1	10	-
LWS	Greenabella Marsh	30	75	-	1	10	-
LWS	Teessaurus Park	30	75	-	1	10	-

Notes:

Data taken from APIS website³⁵ for sites other than LNR and LWS; provided by professional experts for LNR and LWS. Data are presented as the lower limit of the critical load range.

'-' Denotes that no data is available.

5.6. STUDY AREA

CONSTRUCTION PHASE

- 5.6.1. During the construction stage the Study Area for the assessment of impacts has been defined by the criteria in the IAQM Construction Dust guidance¹⁹. An assessment of the risk of Construction Phase impacts is required where there is:
- A human receptor within 350m of the construction DCO Application Boundary or within 50m of the routes used by construction traffic on the public highway up to 500m from the Site entrance; or
 - An ecological receptor within 50m of the construction DCO Application Boundary or within 50m of the routes used by construction traffic on the public highway up to 500m from the Site entrance.
- 5.6.2. For the purpose of the assessment reported in this Chapter, the Study Area for the Construction Phase impact is shown in **Figure 5-11 (Volume 2)**.

OPERATIONAL PHASE

Human Receptors

- 5.6.3. For the assessment of Operational Phase emissions, there is no specific guidance on the required Study Area for the assessment of impacts on human receptors. Therefore, a proportionate approach has been applied using professional judgement, which may vary in subsequent stages of assessment based on preliminary findings.
- 5.6.4. The human receptors have been defined in sub-sections of the Study Area, as follows:
- A receptor grid out to 2km from the DCO Application Boundary has been used on the basis that significant impacts from combustion emissions typically do not occur beyond this distance unless the source is a large combustion plant such as the Combined Cycle Gas Turbine (CCGT).
 - A secondary receptor grid out to 10km has been used to establish where the limits to impacts may lie and ensure that the extent of the impacts from the SAF Plant are considered.
 - Specified receptors within 2km have been used for discrete predictions.
- 5.6.5. The Keadby 3 Low Carbon Gas Power Station Project Development Consent Order (DCO) application (PINS reference EN010114) is one of the first Nationally Significant Infrastructure Projects in the United Kingdom in which detailed, complex atmospheric dispersion modelling of air emissions from carbon capture and storage has been completed. The Keadby Project was granted a DCO in December 2022⁵¹. It is proposed to apply the same impact assessment methodology at an appropriate scale for the Proposed Scheme, with consideration of the air emissions from carbon capture and storage likely to result from the Proposed Scheme.

Ecological Receptors

- 5.6.6. For the assessment of operational impacts on ecological receptors, a conservative Study Area of 15km from the DCO Application Boundary has been applied according to the guidance provided in AQTAG06²⁵³² and the Environment Agency for large combustion plant.

5.7. BASELINE CONDITIONS AND FUTURE BASELINE

LOCAL AIR QUALITY MANAGEMENT

- 5.7.1. The Proposed Scheme is located within the local authority areas of Stockton-on-Tees and Redcar and Cleveland Borough Council, and adjacent to the borders of Middlesbrough Borough Council .
- 5.7.2. The following local authorities are also present within the wider 15km Study Area for large combustion plant but not adjacent to the Proposed Scheme:
- County Durham;
 - Darlington;
 - Hambleton District (North Yorkshire County);
 - Hartlepool; and
 - Scarborough District (North Yorkshire County).
- 5.7.3. Due to the distance or location of these local authorities, no significant effects are expected within these areas. Baseline conditions in these areas will be reported in the ES should assessment indicate that significant effects on local air quality are likely in these areas.
- 5.7.4. The baseline monitoring datasets in this section have been sourced from the 2019 monitoring reported in the 2020 Annual Status Reports (ASR). Monitoring completed in 2019 provides the last complete dataset without the influence of social restrictions caused by the Covid-19 pandemic. The inclusion of the 2020 and 2021 data would necessarily skew any trends towards air quality improvements due to reduced levels of public movement and by extension reduced vehicles on the roads and permitted installation activities in Stockton-on-Tees. As a result, 2020 and 2021 data are discussed but not presented. When approved by DEFRA, monitoring completed in 2022, which will be published in the 2023 ASRs, will provide the first full year of monitoring completed without the influence of the Covid-19 pandemic. Stockton-on-Tees Borough Council and Redcar and Cleveland Borough Council have published 2023 ASRs which are included in the discussions below.

Stockton-on-Tees

- 5.7.5. LAQM information has been taken from the 2020, 2022 and 2023 Air Quality ASRs.
- 5.7.6. The 2023 ASR³⁶ for Stockton-on-Tees identifies the principal source of air pollution in the area as emissions from vehicle traffic. It also notes that there are 43 businesses within the borough regulated by the Environment Agency and 58 businesses regulated

by the local authority under the Environmental Permitting Regulations. All are permitted to emit to air. The 2020 ASR³⁸ indicates that prior to the Covid-19 lockdowns air quality in the borough was already exhibiting a sustained trend for improvement.

- 5.7.7. Monitoring is undertaken through the use of automatic monitors at three sites, and passive diffusion tubes at 13 sites. All of the monitoring undertaken is considered too remote to be representative of local air quality at the Proposed Scheme location. All sites but one recorded a concentration of NO₂ under the objective value of 40µg/m³ in 2019. The single exceedance was at Yarm Road adjacent to the A66 trunk road where a concentration of 40.4µg/m³ was recorded, however this location is approximately 9km from the Proposed Scheme so cannot be considered representative of local air quality at the Proposed Scheme location. In 2022, all of the monitoring sites recorded concentrations of NO₂ under the objective value of 40µg/m³.
- 5.7.8. There is no Stockton-on-Tees air quality monitoring within the operational impacts 2km Study Area for the Proposed Scheme.
- 5.7.9. There are currently no AQMAs declared for Stockton-on-Tees.

Middlesbrough

- 5.7.10. The 2022 ASR for Middlesbrough³⁹ notes that air quality in the borough has been steadily improving since recording began, however the years 2020 and 2021 are included in the analysis which skews the results. Data from the automatic monitoring undertaken in the borough reported in the 2020 ASR⁴⁰ shows a sustained improvement in concentrations of NO₂ to 2019. However, concentrations of particulate matter in both the PM₁₀ and PM_{2.5} fractions appear stable.
- 5.7.11. Middlesbrough currently undertakes monitoring at two continuous, automatic sites and at 22 sites for passive diffusion tubes. All of the monitoring undertaken in Middlesbrough is too remote from the Proposed Scheme to be considered representative of conditions at the Site of the Proposed Scheme.
- 5.7.12. Monitoring locations within the operational impacts 2km Study Area for the Proposed Scheme are shown in **Table 5-8** with monitoring results from the 2020 ASR⁴⁰. A Sens Slope statistic⁵² has been used in order to establish trends in the monitoring data however the use of only five (or less) data points is not enough to determine the statistical significance of a trend. A negative Sens Slope statistic indicates an overall improvement in air quality over the period of monitoring, and a positive statistic indicates an overall deterioration in air quality.

Table 5-8: Middlesbrough NO₂ Monitoring Locations

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Concentration (µg/m ³)					Sens Slope (µg/m ³)
			2015	2016	2017	2018	2019	
BH	450506	519620	15.7	18.1	13.1	14.5	16.1	-0.150
M2	451059	520133	17.9	22.5	18.5	20.8	18.0	-0.113

Location ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Concentration (µg/m ³)					Sens Slope (µg/m ³)
			2015	2016	2017	2018	2019	
M3	451306	519425	26.6	27.8	28.1	29.4	26.1	0.525
M15	450044	519926	19.8	23.4	20.9	24.3	20.4	0.300
M16	449451	520632	33.2	35.4	35.9	30.1	30.5	-0.854
M17	449565	520220	24.3	26.2	22.7	26.3	22.4	-0.313
M18	449161	520411	-	35.9	32.5	33.2	31.3	-1.442
M20	450506	519620	16.3	17.8	17.0	20.8	19.9	1.175
M21	450506	519620	15.5	18.1	16.5	20.7	19.8	1.188
M22	450506	519620	17.7	18.0	17.7	21.0	19.5	0.475
M23	449451	520632	-	-	40.7	31.0	30.9	-4.900

5.7.13. The data in **Table 5-8** shows an even mix of diffusion tube locations where air quality is improving over the 5-year period to 2019 and locations where air quality is deteriorating up to 2019. This is in contrast to the information in the 2022 ASR³⁹ which shows an improvement due to the inclusion of data collected during the Covid-19 pandemic.

5.7.14. There are currently no AQMAs declared for Middlesbrough.

5.7.15. Middlesbrough Borough Council has not yet published a 2023 ASR on air quality at the time of writing.

Redcar and Cleveland

5.7.16. The 2023 ASR⁴¹ for Redcar and Cleveland states that air quality in the borough is considered to be good and in compliance with the UK objectives. The 2020 ASR⁴³ notes that air quality was improving up to publication, which represents a trend for improvement prior to the Covid19 lockdowns.

5.7.17. Up to 2022, Redcar and Cleveland undertook monitoring at a single continuous automatic site and at 20 passive diffusion tube locations, all of which are too remote from the Proposed Scheme and largely located in urban areas, meaning they are not considered to be representative of air quality at the Proposed Site.

5.7.18. Monitoring locations within the operational impacts 2km Study Area for the Proposed Scheme are shown in **Table 5-9** with results from the 2023 ASR⁴¹.

Table 5-9: Redcar and Cleveland NO₂ Monitoring Locations

Location ID	Monitor Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Concentration (µg/m ³)					
				2015	2016	2017	2018	2019	2022
Redcar Dormanstown	Continuous automatic	458379	523486	12.7	11.0	12.0	10.0	9.0	10.0
R17, R18, R19	Passive diffusion	458379	523486	12.7	13.5	14.8	17.5	15.2	11.7
R26	Passive diffusion	453142	520836	21.9	20.5	19.8	24.7	19.5	-
R27	Passive diffusion	454712	520678	-	-	25.5	29.8	24.8	20.6
R51	Passive diffusion	455379	520543	-	-	-	-	-	11.8

5.7.19. The monitoring data shown in **Table 5-9** shows a general improvement in NO₂ pollution across the monitoring sites within the 2km Study Area. In 2022, all of the monitoring sites within the 2km Study Area recorded concentrations of NO₂ under the objective value of 40µg/m³.

5.7.20. There are currently no AQMAs declared for Redcar and Cleveland.

Hartlepool

5.7.21. The 2022 ASR⁵³ for Hartlepool states that air quality in the borough is generally considered to be good in areas where the public are regularly exposed on the basis that monitored concentrations of air pollutants are below the UK objective values. Whilst the ASR states that there is currently no published objective for PM_{2.5}, at the time of publication a limit value of 20µg/m³ had received parliamentary approval¹¹. The two automatic monitors operated by the local authority monitor PM₁₀ and a conversion factor is applied to derive PM_{2.5} concentrations. The Stockton Road monitor has a concentration of 18.9µg/m³ in 2019 (95% of the limit value) and the Headland monitor a concentration of 22.2µg/m³ in 2019 (110% of the limit value). The 2022 ASR records reductions in 2020 and 2021 however these results are considered to be affected by the Covid-19 pandemic restrictions.

5.7.22. Concentrations of both NO₂ and PM₁₀ recorded in 2019 are both substantially below the limit value of 40µg/m³ common to both pollutants.

5.7.23. Hartlepool Borough Council has not yet published a 2023 ASR on air quality at the time of writing.

BACKGROUND AIR QUALITY

5.7.24. Background concentrations of air pollutants have been obtained from DEFRA Background Mapping archive³⁴ for 2023 from the base year of 2018.

5.7.25. Annual average background concentrations of NO₂ within the operational impacts 2km Study Area for the Proposed Scheme location, shown in **Figure 5-1 (Volume 2)**, range

from 11.1µg/m³ to 27.1µg/m³, which is between 28% and 68% of the limit and objective value of 40µg/m³ for the protection of human health.

- 5.7.26. For NO_x in **Figure 5-3 (Volume 2)**, the annual average background concentrations range between 14.9µg/m³ and 44.8µg/m³, which is 50% and 150% of the limit value of 30µg/m³ for the protection of vegetation. Exceedances are evident at the Teesmouth and Cleveland Coast SPA and SSSI.
- 5.7.27. Annual average background concentrations of PM₁₀, shown in **Figure 5-5 (Volume 2)**, range between 9.4µg/m³ and 13.7µg/m³, which is a range of between 24% and 34% of the limit and objective value of 40µg/m³ for the protection of human health.
- 5.7.28. The annual average background concentrations of PM_{2.5}, shown in **Figure 5-7 (Volume 2)**, range from 6.3µg/m³ to 8.8µg/m³, which is 31% and 44% of the limit value of 20µg/m³ for the protection of human health respectively.
- 5.7.29. Background concentrations of NH₃, SO₂ and rates of nutrient nitrogen deposition within the 15km Study Area for effects on designated nature conservation sites have been obtained from the Air Pollution Information System datasets maintained by the Centre for Ecology and Hydrology³⁵. The values are a 3-year average for the period 2019-2021 inclusive.
- 5.7.30. Background concentrations of NH₃, shown in **Figure 5-9 (Volume 2)**, range between 1.4µg/m³ and 2.3µg/m³. All values are less than the Critical Level (CLE) of 3µg/m³ for the protection of higher plants, however, all are in excess of the CLE of 1µg/m³ for the protection of lichens and bryophytes.
- 5.7.31. Background rates of nutrient nitrogen deposition, shown in **Figure 5-10 (Volume 2)**, range from 12.15 kg N/ha/yr to 29.90 kg N/ha/yr. The effect that such rates are having on the local environment will be dependent on the specific sensitivity of the receiving habitats defined by unique Upper and Lower Critical Loads (UCLo and LCLo) for that habitat.
- 5.7.32. Rates of background acid deposition range between 0.96keq/ha/yr and 2.50keq/ha/yr within the 15km Study Area. As with nutrient nitrogen deposition, the effects of acid deposition are dependent on the sensitivity of the receiving habitat along with local concentrations of both nitrogen and sulphur compounds. Background annual average concentrations of SO₂ range between 0.6µg/m³ and 5.1µg/m³ within the Study Area so are low concentrations, substantially below the 20µg/m³ limit for the protection of vegetation.

Summary

- 5.7.33. The background concentrations of air pollutants obtained from DEFRA Background Mapping can be summarised as follows:
- Current background air quality is assessed as good because all the measured values are below the limits and objectives for the protection of human health.
 - For designated nature conservation sites, concentrations of NO_x are in excess of the limit for the protection of vegetation and the upper range of rates of nutrient

nitrogen deposition are higher than the maximum UCLo described for habitats in the Study Area on the APIS website. Concentrations of ammonia are below the $3\mu\text{g}/\text{m}^3$ limit for the protection of higher plants, and none of the sites within the Study Area may have lichens or bryophytes present where the limit would be $1\mu\text{g}/\text{m}^3$.

FUTURE BASELINE

- 5.7.34. Background concentrations of air pollutants have been obtained from DEFRA Background Mapping archive for the expected 2028 Proposed Scheme opening year from the base year of 2018⁵⁴.
- 5.7.35. Annual average background concentrations of NO_2 within operational impacts 2km Study Area for the Proposed Scheme location, as shown in **Figure 5-2 (Volume 2)**, range between $10.1\mu\text{g}/\text{m}^3$ and $26.3\mu\text{g}/\text{m}^3$, which is between 25% and 66% of the limit and objective value of $40\mu\text{g}/\text{m}^3$ for the protection of human health.
- 5.7.36. For NO_x , the annual average background concentrations range from $13.4\mu\text{g}/\text{m}^3$ to $42.9\mu\text{g}/\text{m}^3$, as shown in **Figure 5-4 (Volume 2)**, which is 45% and 143% of the limit value of $30\mu\text{g}/\text{m}^3$ for the protection of vegetation.
- 5.7.37. Annual average background concentrations of PM_{10} shown in **Figure 5-6 (Volume 2)** range from $9.1\mu\text{g}/\text{m}^3$ to $13.4\mu\text{g}/\text{m}^3$, which is a range of between 23% and 34% of the limit and objective value of $40\mu\text{g}/\text{m}^3$ for the protection of human health and is little changed from 2023.
- 5.7.38. The annual average background concentrations of $\text{PM}_{2.5}$ shown in **Figure 5-8 (Volume 2)** range from $6.1\mu\text{g}/\text{m}^3$ and $8.6\mu\text{g}/\text{m}^3$ and is little changed from 2023. However, the 2028 interim limit of $12\mu\text{g}/\text{m}^3$ for $\text{PM}_{2.5}$ will apply, making the concentrations between 51% and 72% of the limit value for the protection of human health.
- 5.7.39. The future baseline for background concentrations of NH_3 and rates of nutrient nitrogen deposition is based upon the 2019-21 data from APIS³⁵ with the application of factors from the JNCC Nitrogen Futures report (business as usual case assuming emissions ceiling not met)²⁵ to provide the values for the expected Proposed Scheme opening year 2028.
- 5.7.40. Background concentrations of NH_3 range from $1.40\mu\text{g}/\text{m}^3$ to $2.35\mu\text{g}/\text{m}^3$ which is a slight increase compared to 2023 in line with the JNCC Nitrogen Futures predictions.
- 5.7.41. Background rates of nutrient nitrogen deposition range from $11.01\text{kg N}/\text{ha}/\text{yr}$ to $27.05\text{kg N}/\text{ha}/\text{yr}$ representing a slight reduction compared to 2023.

SCHEME-SPECIFIC BASELINE MONITORING

- 5.7.42. An air quality monitoring programme has been designed to provide datasets to inform the assessment of human health and ecological impacts from air emissions. Localised monitoring of rates of dust deposition at specific sensitive locations are also included for the purpose of assessing amenity impacts.

5.7.43. Scheme-specific air quality monitoring is being carried out to supplement the air quality data available from Local Authority monitoring and the DEFRA Background Mapping archive⁵⁴.

5.7.44. Air quality monitoring for a minimum period of six months is being completed for the purpose of characterising localised background and baseline conditions. The pollutants being monitored, locations of monitoring equipment and duration of the monitoring have been agreed in consultation with Natural England and the Environmental Health Officers at STBC. All monitoring results will be reported in the ES and incorporated in the assessment of air quality impacts.

Pollutants

5.7.45. The air quality monitoring programme will characterise ambient concentrations of NO₂, SO₂ and NH₃ and deposited dust. NH₃ is being monitored as it is a constituent of overall nitrogen deposition.

Locations

5.7.46. Air quality monitoring is being undertaken at eleven sites within the vicinity of the DCO Application Boundary and wider Stockton-on-Tees area, as agreed with the STBC EHO. One additional monitoring site will be placed at the Automatic Urban and Rural Network (AURN) in Leeds^b. The monitoring locations and pollutants being monitored at each site are shown in **Figure 5-12 (Volume 2)** and are summarised as:

1. 10 Samphire Street - NO₂ and SO₂ using diffusion tubes.
2. Navigator, Huntsman Drive - NO₂ and SO₂ using diffusion tubes, dust deposition using a passive dust deposition sampler and NH₃ using an alpha sampler.
3. RSPB Saltholme - NO₂ and SO₂ using diffusion tubes, dust deposition using a passive dust deposition sampler and NH₃ using an alpha sampler.
4. Seal Sands - NO₂ and SO₂ using diffusion tubes, and dust deposition using a passive dust deposition sampler.
5. Lighthouse Green Fuels, Huntsman Drive – NO₂ and SO₂ using diffusion tubes, dust deposition using a passive dust deposition sampler and NH₃ using an alpha sampler.
6. Navigator, Seal Sands - NO₂ and SO₂ using diffusion tubes, dust deposition using a passive dust deposition sampler and NH₃ using an alpha sampler.
7. Cowpen Lane, Cowpen Bewley - NO₂ and SO₂ using diffusion tubes.
8. Cowpen Bewley Woodland Country Park LNR - NH₃ using an alpha sampler.
9. AURN Leeds - NO₂ and SO₂ using diffusion tubes.

^b The AURN in Leeds was selected for the co-location study as it was the closest accessible AURN which housed continuous monitors of both NO₂ and SO₂. The AURN site is used for calibration of the NO₂ and SO₂ passive diffusion tubes, for which purpose the specific location of the AURN is not important.

10. Port Clarence Road (A1046) – NO₂ using diffusion tubes.
11. Seaton Carew Road (A178) – NO₂ using diffusion tubes.
12. A1185 – NO₂ using diffusion tubes.

Techniques

- 5.7.47. Monitoring is being undertaken for a minimum period of six months for each pollutant across sites 1 to 9 (inclusive). Monitoring of NO₂ at roadside sites 10, 11 and 12 is being undertaken for the purpose of verifying the ADMS models for construction and operational traffic for an initial three month period for the purpose of model verification.
- 5.7.48. The monitoring techniques outlined below are in line with recommended sampling practice from the Centre for Ecology and Hydrology⁵⁵ and outlined in the DEFRA LAQM.TG(22)²² guidance.
- 5.7.49. Concentrations of SO₂ and NO₂ are being monitored via passive diffusion tubes within the Stockton-on-Tees area (seven sites for SO₂ and 10 sites for NO₂). Additional monitoring is located at the AURN site, where NO₂ and SO₂ passive diffusion tubes will be co-located with the AURN continuous monitors to facilitate annualisation and bias adjustment in line with the DEFRA LAQM.TG(22)²² guidance.
- 5.7.50. Concentrations of NH₃ are being measured using Centre for Ecology and Hydrology⁵⁶ passive alpha samplers at five sites in the Stockton-on-Tees area. The locations of the NH₃ monitoring sites were selected, where possible, in areas where local sources of NH₃ were low to allow monitoring of the ambient background.
- 5.7.51. Samplers for NH₃, SO₂ and NO₂ will be exposed for approximately 30-day periods and will be installed and removed in line with the DEFRA diffusion tube calendar⁵⁷ where practicable.
- 5.7.52. Dust deposition is being measured via passive dust deposition samplers at five sites in the Stockton-on-Tees area. The dust deposition samplers will be exposed for approximately 14-days and will be analysed for the mass of deposited dust and heavy metals using ICP-OES analysis.

5.8. EMBEDDED DESIGN, MITIGATION AND ENHANCEMENT MEASURES

- 5.8.1. This section sets out the embedded design, mitigation and enhancement measures relevant to the air quality assessment (as defined in **Chapter 3: Approach to EIA (Volume 1)**). These measures will continue to be refined and developed as the design evolves, with updates presented in the ES.

CONSTRUCTION PHASE

- 5.8.2. Mitigation measures for construction dust impacts will be included within the OCoCP for the Proposed Scheme. The following measures are the minimum measures taken from IAQM Construction Dust guidance¹⁹ that would be required on any construction site, which would be the minimum requirement for the Proposed Scheme. The Construction Phase assessment considers the effectiveness of the minimum measures. If necessary,

additional mitigation would be determined following the Construction Phase assessment (Section 5.8):

Communications

- Display the name and contact details of person(s) accountable for air quality and dust issues on the Site. This may be the environment manager/engineer or the Site Manager; and
- Display the head or regional office contact information.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Make the complaints log available to the local authority upon request; and
- Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.

Monitoring

- Undertake daily onsite and offsite inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of the Site Boundary, with cleaning to be provided if necessary;
- Carry out regular site inspections to monitor compliance with the dust management plan (DMP), record inspection results, and make an inspection log available to the local authority when asked; and
- Increase the frequency of site inspections by the person accountable for air quality and dust issues onsite when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and Maintaining the Site

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- Where appropriate, erect solid screens or barriers around dusty activities or the DCO Application Boundary that are at least as high as any stockpiles on Site;
- Fully enclose site or specific operations, where appropriate, where there is a high potential for dust production and the Site is active for an extensive period;
- Avoid site runoff of water or mud;
- Keep site fencing, barriers and scaffolding clean using wet methods;

- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used onsite. If they are being re-used onsite cover as described below; and
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle / Machinery and Sustainable Travel

- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable; and
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).

Construction Phase Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- Ensure an adequate water supply on the Site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- Use enclosed chutes and conveyors and covered skips;
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- Ensure equipment is readily available onsite to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

Waste Management

- Prohibit bonfires and burning of waste materials.

Measures Specific to Construction Activities

- Avoid scabbling (roughening of concrete surfaces) if possible; and
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.

Measures Specific to Trackout

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the Site. This may require the sweeper being continuously in use;
- Avoid dry sweeping of large areas;
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;
- Record all inspections of haul routes and any subsequent action in a site logbook; and
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the Site where reasonably practicable).

OPERATION PHASE

- 5.8.3. Adherence to the conditions of any environmental permit defined by the Environment Agency will ensure that mitigation is effective for the operation of the plant. Furthermore, the project will embed best practice for the minimisation and control of emissions throughout the SAF production and energy generation process through the incorporation of the following emission control techniques into the evolving design:

Feedstock Handling

- All dry biomass transfer points to be enclosed and ventilated to prevent dust explosions. Moisture content within the Biocarbon Feedstock will be controlled.

Fischer-Tropsch Synthesis

- The FT process will be a closed process by design and there are no emissions points between the input from the previous process and output to the following process. All by-products of the FT process would be recycled to the Gasification Facility and/or used in the existing CCGT power plant and/or Auxiliary Boiler.

Fuel Product Storage:

- Tank venting and vapour recovery systems will be in place during loading/unloading of naphtha and SAF to prevent flammable vapour releases.

Leak Detection

- Routine leak detection and repair programmes for valves, flanges, pumps, etc., will be used to minimise fugitive emissions.

Wastewater Treatment Plant

- The sealed and covered tanks at the Wastewater Treatment plant will be an effective control measure to prevent odour emissions; and

Surface Water Pond

- The surface water pond will be used for uncontaminated surface water which is odourless.

Feedstock Silos

- The moisture content and air flow within feedstock silos will be regularly monitored to help prevent the development of anaerobic conditions and potential microbial odours.

Gasifier Units

- During the gasification process, the gasifier trains will generate small levels of H₂S and COS in the syngas stream, both of which can cause odours even at low concentrations;
- Gasifier trains are fully enclosed systems. Upset conditions will cause the syngas generated syngas to the on-site flare system;
- Ambient vents will feature filters;
- H₂S is treated in the syngas cleanup unit. H₂S will be extracted from the syngas, combusted and the subsequent SO₂ scrubbed in the caustic scrubber; and
- Where precautionary abatements are considered necessary, the following measurements could be implemented for personnel entering the area in proximity to the gasification slag outlet vents:
 - Implementation of occupational hygiene monitoring to quantify exposures and validate the need for abatement controls;
 - Ensure adequate ventilation;
 - Minimise the time which personnel spent near outlets;
 - Evaluate the need for continuous gas detectors. Given the low emission rates, periodic monitoring may suffice;
 - Provide personnel with respirators for maintenance activities near outlets;
 - Train personnel on recognising H₂S and COS odours and reporting complaints. Perform odour monitoring in response; and
 - Finally, these vents could be directed through an odour abatement filter (Activated Carbon Filter) if required.

5.9. PRELIMINARY ASSESSMENT OF LIKELY IMPACTS AND EFFECTS

5.9.1. This section details the preliminary assessment of impacts and effects for the Proposed Scheme during both the Construction and Operation Phases considering the embedded design, mitigation and enhancement measures detailed in **Section 5.8**.

CONSTRUCTION PHASE

5.9.2. The likely potential significant effects for air quality associated with the Construction Phase are set out below.

Construction Phase Fugitive Dust

- 5.9.3. A preliminary qualitative dust assessment has been completed with reference to the IAQM Construction Dust guidance¹⁹ to determine the potential for dust impacts at human and ecological receptors within the Construction Phase Study Area. **Appendix 5B: Construction Phase Dust Assessment (Volume 3)** provides details of the construction dust assessment approach and associated findings. A summary of the findings is presented below.
- 5.9.4. Construction activities that have the potential to generate and/or re-suspend dust, PM₁₀ and PM_{2.5} include:
- Site clearance and preparation;
 - Preparation of temporary access/egress to the Site and haulage routes;
 - Earthworks;
 - Materials handling, storage, stockpiling, spillage and disposal;
 - Movement of vehicles and construction traffic within the Site;
 - Construction of buildings, roads and areas of hardstanding alongside fabrication processes;
 - Internal and external finishing refurbishment; and
 - Site landscaping.
- 5.9.5. Most dust releases are likely to occur during the working week. However, for some potential release sources (e.g. exposed soil produced from significant earthworks activities), in the absence of dust control mitigation measures, dust generation has the potential to occur 24 hours per day over the period during which such activities are to take place.
- 5.9.6. Based on a review of the Construction Phase Study Area (**Figure 5-11 (Volume 2)**), there are human receptors located within approximately 350m of the Site and/or within approximately 50m of the likely routes to be used by construction vehicles, up to approximately 500m from the Site entrance (where construction traffic enters and/or leaves the area of construction works).
- 5.9.7. The next stage of the assessment requires the potential dust emission magnitude to be determined for dust and PM₁₀ sources: earthworks, construction, and trackout. Overall, the dust emission magnitude from each of these activities is assessed as 'large' when assessed against the criteria described in **Appendix 5B: Construction Phase Dust Assessment (Volume 3)** based on the following preliminary design information:
- Earthworks:
 - The total area within the Site encompasses 274.49 hectares (2,744,906m²) but the earthwork activities will take place within an area <475,000m² in size. The soil type is potentially dusty silt, and it is assumed that there will be more than 10 earth-moving vehicles onsite during peak earthwork activities and up to 100,000 tonnes of material moved in total.

- Construction:
 - It is assumed that the total volume of all buildings to be constructed will exceed 100,000m³.
- Trackout:
 - There will be an estimated 60 HDV movements (120 AADT) per day during peak construction activity.

5.9.8. Whilst the dust emission magnitude has been assessed as large when rigidly following the IAQM Construction Dust guidance¹⁹ criteria, there are a number of factors due to the variable nature of works on Site which have enabled the application of professional judgement in assessing dust magnitude. These include:

- Earthworks:
 - The Site is already partially concreted therefore it is unlikely that large volumes of earthworks (up to 475,000m² in size) will in fact be required at any given time. Therefore, it is judged that the total site area available for dust disturbance via earthworks will lie in the range of 2,500 – 10,000m², which corresponds to a magnitude of medium.
- Construction:
 - A large volume is expected for the buildings to be constructed. However, these will be largely from metalliferous and prefabricated materials and unlikely to result in substantial quantities of dust. The magnitude of construction is therefore assessed as medium.
- Trackout:
 - Whilst a quantity of HDV movements in excess of 50 AADT is predicted, the presence of paved roads and a paved construction area will minimise tracked out material. The magnitude of trackout is therefore assessed as medium.

5.9.9. Taking the above factors into account the dust emission magnitude is reduced to the values shown in **Table 5-10**.

Table 5-10: Summary Dust Emission Magnitude

Activity	Dust Emission Magnitude
Earthworks	Medium
Construction	Medium
Trackout	Medium

5.9.10. The next stage of the assessment requires the sensitivity of the area to dust soiling and human health effects, which are based on identifying the number of properties and human receptors located within discrete distance bands from the Site Boundary. As shown in **Figure 5-11 (Volume 2)** the distance bands are set at:

- 20m, 50m, 100m, 200m and 350m from the Site Boundary for human receptors; and
- 25m and 50m from the Site Boundary for ecological receptors.

- 5.9.11. The prevailing wind direction in the UK is for winds to originate from the south-west, therefore any properties or designated sites to the north-east would be most likely to be affected by fugitive dust and emissions.
- 5.9.12. Under low wind speed conditions, it is likely that the majority of dust would be deposited in the area immediately surrounding the source because dispersion of dust will be limited. By conservatively assuming that any construction activities could occur anywhere within the Site, sensitive receptors within approximately 100m of the Site would include residential and commercial properties along the A178, the A1046, Samphire Street, Saltview Terrace, Queen’s Terrace and Victoria Terrace. Within approximately 350m from the DCO Application Boundary are residential receptors along Laburnum Grove, Holly Terrace, Poplar Terrace, Palm Terrace, Broadway West, Wilton Avenue and educational receptors at High Clarence Primary School. Commercial receptors within approximately 350m from the Site would include those along Deport Road, Vulcan Street, Ferry Road, Durham Street, Commercial Street, Priestman Road, Limerick Road, Dabholm Road and those within the Seal Sands Industrial area.
- 5.9.13. The closest properties to trackout routes are commercial properties along Huntsman Drive. Material transfer is anticipated to be undertaken using Self Propelled Modular Transport barges on the River Tees, with material transferred to site along a temporary haul road in place for the construction period only. Where HDVs are used for material transfer, vehicles are anticipated to head directly to the A19 via the A1185 to the north and A1046 to the south.
- 5.9.14. The Teesmouth and Cleveland Coast SPA, RAMSAR and SSSI sits partly within the Site Boundary, and is within 20m of the west, south and eastern Site Boundary areas.
- 5.9.15. Taking account of the above, and that the background annual mean PM₁₀ concentration is 10.7µg/m³ within the Construction Phase Study Area, the IAQM Construction Dust guidance¹⁹ criteria have been used to determine that the sensitivity of the area is high for dust soiling effects, and low for human health impacts and high for ecological (PM₁₀) impacts for all relevant construction activities. The sensitivity of the area is defined in **Table 5-11**.

Table 5-11: Outcome of Defining the Sensitivity of the Area

Potential Impact	Sensitivity of the Surrounding Area		
	Earthworks	Construction	Trackout
Dust soiling	High	High	Medium
Human health	Low	Low	Low
Ecological	High	High	High

5.9.16. By combining the dust emission magnitude with the sensitivity of the area, the risk of construction dust effects without mitigation applied is shown in **Table 5-12** below. Given that the overall dust risk is High Risk, there is potential for temporary, moderate adverse effects without additional mitigation. These effects are most likely to occur when earthworks and construction activities are being undertaken in the southern and western areas of the Site, where the Site is closer to receptor points.

Table 5-12: Summary Dust Risk Table to Define Site-Specific Mitigation

Potential Impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Medium Risk	Medium Risk	Medium Risk
Human health	Low Risk	Low Risk	Low Risk
Ecological	Medium Risk	Medium Risk	Medium Risk

5.9.17. The assessed risk rating has been used to determine the appropriate prevention and mitigation measures to reduce the impact to not significant, as recommended in the IAQM Construction Dust guidance¹⁹ These will be implemented via the OCoCP submitted with the application for development consent. These measures are presented in **Section 5.10**.

5.9.18. Following implementation of the mitigation measures in the OCoCP (**Section 5.9**) in line with the IAQM Construction Dust Guidance¹⁹, the below outcomes are expected:

- For the assessment of effects on dust soiling the sensitivity of the area is high. The magnitude of change is medium. Therefore, there is likely to be a direct, temporary, short-term, **Minor Adverse (not significant)** effect on nearby places of work as described in **Chapter 14: Socio-economics (Volume 1)**
- For the assessment of effects on human health the sensitivity of the area is low. The magnitude of change is medium. Therefore, there is likely to be a direct, temporary, short term, **Minor Adverse (not significant)** effect on nearby places of work as described in **Chapter 14: Socio-economics (Volume 1)**.
- For the assessment of effects on ecological sites the sensitivity of the area is high. The magnitude of change is medium. Therefore, there is likely to be a direct, temporary, short term, **Minor Adverse (not significant)** effect on the Teesmouth and Cleveland Coast SPA, RAMSAR and SSSI as described in **Chapter 7: Terrestrial Ecology (Volume 1) and Chapter 8: Freshwater and Marine Ecology (Volume 1)**.

Non-Road Mobile Machinery (NO₂, PM₁₀ and PM_{2.5})

5.9.19. The greatest impact on air quality due to emissions from vehicles and plant associated with the Construction Phase will be in the areas immediately adjacent to the Site access. It is anticipated that construction traffic will access the Site via Huntsman Drive. Most of the immediate surrounding area is in industrial use, and therefore (as per IAQM

Construction Dust guidance¹⁹), is not considered to be a long-term receptor. The sensitivity of the surrounding area for human health is low.

- 5.9.20. Final details of the exact plant and equipment likely to be used onsite will be determined by the appointed contractor. The plant and equipment are likely to comprise dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks. The number of plant and their location within the Site will vary over the construction period. There will be an offset distance between any potential humans and any Non-Road Mobile Machinery (NRMM) and not all of the plant will operate at the same time in the same location. Therefore, the magnitude of change is likely to be low.
- 5.9.21. For the assessment of effects on human health the sensitivity is low. The magnitude of change is also low. Therefore, there is likely to be a direct, temporary, short term, **Negligible** effect on human health (**not significant**).
- 5.9.22. Abnormal Indivisible Loads (AILs) will be transported, where required, by Self-Propelled Modular Transport (SPMT) from either the Clarence Wharf (Option 2) or Wilton Engineering Wharf (Option 1). The number of AIL required and the number and type of SPMT will be confirmed at ES but is currently estimated to be 250 across the Construction Phase. NRMM movements are expected to be short-term and transient in nature and therefore impacts on designated sites are not expected to be significant. This conclusion will be supported through the use of evolved design information available at the ES stage.

Road Traffic (NO₂, PM₁₀ and PM_{2.5})

- 5.9.23. The potential effects of the Proposed Scheme were assessed by comparing the results of the DS scenario against the DM scenario for the Construction Phase in the year 2026, estimated to be the peak construction period. Locations of the receptors and their predicted concentration changes are shown in **Figure 5-14 (Volume 2)**.

Human Health Receptors

- 5.9.24. **Table 5-13** shows the summary of air quality impacts from the Construction Phase in 2026 for the assessed human health receptors. Full details on the modelled receptors can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

Table 5-13 - Summary of Construction Road Traffic Phase Dispersion Modelling Results for Human Health Receptors

		NO₂	PM₁₀	PM_{2.5}
	Objective (µg/m³)	40	40	20
Maximum Annual Mean Concentrations (µg/m³)	DM (2026)	19.0	14.3	8.0
	DS (2026)	19.3	14.4	8.1
	DM (2026) Exceedances	0	0	0
	DS (2026) Exceedances	0	0	0

		NO₂	PM₁₀	PM_{2.5}
	Objective (µg/m³)	40	40	20
Number of Properties greater than objective value	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement (decrease in concentrations)	0	0	0
	No Change	3	6	6
	Deterioration (increase in concentrations)	8	5	5
DS-DM (µg/m³)	Max Improvement	<0.1	<0.1	<0.1
	Max Worsening	0.4	0.1	0.1

- 5.9.25. **Table 5-13** shows that for all pollutants modelled, concentrations are not predicted to exceed the respective objectives at any of the assessment receptors, either with or without the Proposed Scheme in operation.
- 5.9.26. Some receptors are predicted to experience no discernible change in air quality for either NO₂, PM₁₀ or PM_{2.5}, and others to experience a worsening of air quality. No receptors are predicted to experience an improvement in air quality.
- 5.9.27. For NO₂, the maximum worsening (i.e. the largest increase in concentrations) is 0.4µg/m³ at two residential receptors (R9 and R11) located on Saltview Terrace in Port Clarence. For R9 the DM NO₂ concentration is 16.0µg/m³ and for DS is 16.4µg/m³. For R11 the DM NO₂ concentration is 15.7µg/m³ and the DS is 16.0µg/m³. This worsening of air quality is due to traffic from the Proposed Development moving along the A178.
- 5.9.28. For PM₁₀, the maximum worsening is 0.1µg/m³, which occurs at five of the eleven residential receptors. The worsening of 0.1µg/m³ occurs at receptors R2 (A1185 near Billingham), R8 and R10 (Port Clarence Road), R9 and R11 (Saltview Terrace). Of these receptors, the highest DS PM₁₀ concentration is at R2 (DM 14.3µg/m³ and DS 14.4µg/m³).
- 5.9.30. For PM_{2.5}, the maximum worsening is 0.1µg/m³ at the same five residential receptors where PM₁₀ concentrations worsened. Of these, the maximum DS PM_{2.5} concentration is at R2 (DM 8.0µg/m³ and DS 8.1µg/m³).
- 5.9.31. In general, receptors located to the south of the Proposed Scheme (along the A178, A1046 and adjacent roads) are predicted to experience an increase in pollutant concentrations. Those receptors located along the A1185 and adjacent roads, with the exception of R2, are predicted to experience no change in pollutant concentrations as a result of the Construction Phase traffic flows.

5.9.32. A judgement of impact significance has been made following the methodology described in **Section 5.5**. It is judged that there will be a **Negligible and Not Significant** effect on all human receptors prior to the implementation of mitigation measures based on the following assessment results:

- No human receptors are predicted to experience an exceedance of the NO₂, PM₁₀ or PM_{2.5} objectives with or without the Proposed Scheme construction traffic; and
- The maximum impact is 0.4µg/m³ (NO₂), 0.1µg/m³ (PM₁₀) and 0.1µg/m³ (PM_{2.5}) which are <10% of the AQALs.

Ecological Receptors

Annual Mean NO_x Concentrations

- 5.9.33. The critical level (CL_e) for annual mean NO_x is 30µg/m³. As shown in **Appendix 5E: Detailed Modelling Results (Volume 3)**, in 2026 without the Proposed Scheme, the Teesmouth and Cleveland Coast SPA/SSSI is predicted to experience an exceedance of the NO_x CL_e at two receptors (E5 and E9). No additional exceedances of the NO_x CL_e at the receptors within the Teesmouth and Cleveland Coast SPA/SSSI are predicted with the addition of the Proposed Scheme.
- 5.9.34. The Cowpen Bewley Woodland Country Park LNR is not predicted to exceed the NO_x annual mean CL_e under either the DM or DS scenario in 2026.
- 5.9.35. All of the ecological receptors assessed in the Construction Phase are predicted to experience an increase in the concentration of NO_x in the DS scenario relative to the DM. Of these, receptors E3, E4, E5, E6, E7, E8 and E9 (all of which are within the Teesmouth and Cleveland Coast SPA/SSSI) are predicted to experience an increase in NO_x concentrations greater than 1% of the CL_e as a result of the Proposed Scheme.
- 5.9.36. The preliminary assessment of construction road traffic has embedded conservatism in that a precautionary adjustment factor of 3.0 has been applied. Once scheme-specific air quality monitoring is complete, a bespoke adjustment factor will be determined which is likely to be lower than 3.0 and result in reduced impacts. The sensitive receptors for designated ecological sites in the preliminary assessment are roadside locations where the worst-case impacts will occur, and where the designated sites are likely to be already degraded from the existing road. The embedded conservatism in the preliminary assessment determines that further assessment is required.
- 5.9.37. However, the preliminary assessment of the impact of the Proposed Development at the Teesmouth and Cleveland Coast SPA/SSSI shows that two receptors exceed the CL_e, and multiple receptors show a change of more than 1% of the CL_e. As such, it cannot be ruled out that significant effects will be experienced as a result of the Proposed Scheme without further assessment refinements, which will be implemented at the ES stage. The preliminary result of the assessment is therefore discussed in **Chapter 7: Terrestrial Ecology (Volume 1)**.
- 5.9.38. Full details on the modelled receptors for each designated site can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

Annual Mean NH₃ Concentrations

- 5.9.39. Where applicable, the CLe for NH₃ is 3µg/m³. As shown in **Appendix 5E: Detailed Modelling Results (Volume 3)**, none of the ecological receptors are predicted to experience an exceedance of the NH₃ CLe under either the DM or DS scenario.
- 5.9.40. For all ecological receptors assessed, no change in NH₃ concentrations was predicted. As such, it is unlikely that potential impacts will occur resulting from the additional traffic flows of the Proposed Scheme during the Construction Phase and the effects are **Negligible (Not Significant)**.

Annual Mean N Deposition

- 5.9.41. As shown in **Appendix 5E: Detailed Modelling Results (Volume 3)**, all of the receptors within the Teesmouth and Cleveland Coast SPA/SSSI and the Cowpen Bewley Woodland Country Park LNR are far in exceedance of the N deposition lower critical load (CLo) (5kg/ha/yr) without the Proposed Scheme.
- 5.9.42. As a result of the change in traffic flow and behaviour associated with the Construction Phase of the Proposed Scheme, N deposition rates are predicted to increase at all of the assessed ecological receptors. A change in excess of 1% of the relevant CLo is predicted at five receptors (E3, E5, E6, E8 and E9, all within the Teesmouth and Cleveland Coast SPA/SSSI). Of these, the greatest increase is experienced at receptor E9, with N deposition in the DM at 18.95kg/ha/yr relative to 19.09kg/ha/yr in the DS, a change of 2.8% of the lower CLo.
- 5.9.43. The Teesmouth and Cleveland Coast SPA/SSSI experiences exceedances of the CLo and a change of more than 1% of the lower CLo and, as such, the potential for impacts resulting from the Proposed Scheme cannot be ruled out. The preliminary result of the assessment is therefore discussed in **Chapter 7: Terrestrial Ecology (Volume 1)**. However, the embedded conservatism in the preliminary assessment determines that further assessment is required.
- 5.9.44. Details on the modelled receptors for each designated site can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

Summary of Impacts at Ecological Receptors

- 5.9.45. The Teesmouth and Cleveland Coast SPA/SSSI is predicted to experience increases greater than 1% of the CLe for NO_x and 1% of the CLo for N deposition during the Construction Phase. Although the assessment approach includes inherent precaution, the potential for impacts cannot be ruled out at the preliminary assessment stage and are discussed in **Chapter 7: Terrestrial Ecology (Volume 1)**. However, the embedded conservatism in the preliminary assessment determines that further assessment is required, which will be completed at the ES stage.
- 5.9.46. Further information on these ecological receptors are reported in **Chapter 7: Terrestrial Ecology (Volume 1)** and/or **Chapter 8: Freshwater and Marine Ecology (Volume 1)**.

OPERATIONAL PHASE

Emissions of Pollutants arising from the SAF Plant

Potential Effects on Human Receptors

- 5.9.47. The likely potential significant effects for air quality associated with the operation phase of the SAF Plant are summarised below.
- 5.9.48. The following figures show the spatial distribution of modelled impacts that do not screen as negligible against the project criteria set out in **Table 5-5**:
- **Figure 5-16 (Volume 2)**: Operational SAF NO₂ Annual PC
 - **Figure 5-17 (Volume 2)**: Operational SAF NO₂ Hourly PC
 - **Figure 5-18 (Volume 2)**: Operational SAF SO₂ 15-minute PC
 - **Figure 5-19 (Volume 2)**: Operational SAF SO₂ Daily PC
 - **Figure 5-20 (Volume 2)**: Operational SAF UHC Annual PC
- 5.9.49. The full results of the SAF Plant modelling at the Operational Phase are provided in **Appendix 5E: Detailed Modelling Results (Volume 3)**.
- 5.9.50. The maximum ground level concentrations (the Proposed Scheme impacts) for all assessed pollutants, anywhere within the receptor grid for any of the five years' worth of meteorological data modelled, are shown in **Table 5-14** and **Table 5-15**.
- 5.9.51. Pollutants for which the maximum adverse impact cannot be screened out as being negligible, i.e., with an impact >1% of the long-term standard or >10% of the short-term standard, are shown in **bold**. Furthermore, where the predicted maximum adverse impact on ground level receptors cannot be screened out as negligible, the background concentration and PECs have been reported.
- 5.9.52. The maximum modelled annual mean NO₂ PC at ground level with the operation of the SAF Plant is 2.5µg/m³, which occurs <100m to the northwest from the Caustic Scrubber stack. The PEC at the point of maximum impact is 29.6µg/m³ (74% of the long-term standard). However, impacts greater than 0.4µg/m³ (1% of the long-term standard) are limited to the industrial area of Seal Sands.
- 5.9.53. The highest annual mean NO₂ impact at residential properties in Port Clarence is 0.1µg/m³ (0.3% of the standard). The highest PEC at residential properties within Port Clarence is 27.2µg/m³, which is 68.1% of the long-term standard, and therefore can be screened as negligible.
- 5.9.54. The maximum modelled hourly mean NO₂ PC at ground level with the operation of the SAF Plant is 21.6µg/m³, which occurs which occurs <100m to the northwest from the Caustic Scrubber stack. At all other points within the modelled receptor grid, the modelled hourly mean NO₂ is below 20µg/m³ (10% of the short-term standard).
- 5.9.55. At the residential properties within Port Clarence, the highest modelled hourly mean NO₂ is 1.4µg/m³ (0.7% of the short-term standard), at which point the PEC is 55.7µg/m³ (27.8% of the standard).

- 5.9.56. The maximum modelled 15-minute average SO₂ is 42.6µg/m³ (16.0% of the short-term standard). As with NO₂, the maximum SO₂ 15-minute modelled concentration occurs within 100m to the northwest of the Caustic Scrubber stack. All receptors for which the 15-minute average SO₂ concentration exceeds 10% of the short-term standard are located within 200m to the northwest of the Caustic Scrubber stack.
- 5.9.57. The highest modelled 15-minute average SO₂ concentration predicted at the residential properties within Port Clarence is 2.3µg/m³, which is 0.8% of the standard.
- 5.9.58. For daily mean SO₂, the maximum modelled concentration across the receptor grid is 15.7µg/m³, which is 12.6% of the short-term standard. All receptors for which the 24-hour average SO₂ concentration exceeds 10% of the short-term standard are located within 150m to the northwest of the Caustic Scrubber stack. The highest modelled 24-hour average SO₂ concentration predicted at the residential properties within Port Clarence is 0.7µg/m³, which is 0.8% of the standard.
- 5.9.59. With the exception of UHC, for all other assessed pollutants the impacts are Negligible (<1% of the long-term standard / <10% of the short-term standard).
- 5.9.60. For UHCs, the maximum ground level concentrations anywhere within the receptor grid for any of the five years' worth of meteorological data modelled, are shown in **Table 5-15**.
- 5.9.61. The modelled concentrations of UHCs across the receptor grid have been compared to the annual mean air quality standard for benzene (5µg/m³). The off-gas will have a number of different constituents, of which for the CCGT Plant the majority will be methane. No off-site AQAL is available for methane and, as such, the threshold for benzene has been used as a proxy as this is likely to be one of a suite of hydrocarbons included within the emissions estimate for UHCs. This methodology will be reviewed at the ES once detailed design information is available for the constituents of the off-gas. At the point of maximum impact, the annual mean concentration of UHC is 0.7µg/m³, which is 14.9% of the benzene standard. The maximum impact occurs <150m to the east of the existing CCGT Plant.
- 5.9.65. At the residential receptors within Port Clarence, the highest modelled annual mean concentration of UHCs is 0.02µg/m³, which is 0.46% of the long-term benzene standard.

Summary of Impacts on Human Receptors

- 5.9.66. The assessment of the operation of the SAF Plant on human health receptors shows that the impacts of PM₁₀ (24-hour and annual), PM_{2.5} (annual), SO₂ (1-hour) and CO (8 hour) are Negligible and Not Significant across the receptor grid.
- 5.9.67. The maximum impacts of NO₂ (1-hour and annual) and SO₂ (15-minute and 24-hour) have been judged to be Slight (Adverse). Given the embedded conservatism of the preliminary model, it is judged that these impacts are Not Significant. However, these judgments will be reviewed at the ES stage with updated modelling utilising evolved design information.
- 5.9.68. The maximum impact of UHC (annual) across the receptor grid cannot be screened as negligible when compared to the benzene standard. The significance of the impact

cannot be determined due to the lack of baseline concentrations. Therefore, UHC emissions will be further assessed at the ES with updated design information.

Table 5-14 - Maximum ground level concentrations across the Study Area

Pollutant	Averaging time	With Proposed Scheme Max Mean PC ($\mu\text{g}/\text{m}^3$)	Air Quality Standard ($\mu\text{g}/\text{m}^3$)	Max Adverse as % of Standard	2023 Background Concentration ($\mu\text{g}/\text{m}^3$)¹	PEC ($\mu\text{g}/\text{m}^3$)¹	PEC as % of Standard¹	Impact
NO₂	1 hour	21.6	200	10.8%	27.1	75.9 ²	37.9%	Slight (adverse)
	Annual	2.5	40	6.2%	27.1	29.6	74.0%	Slight (adverse)
PM₁₀	Daily	0.0016	50	0.003%	-	-	-	Negligible
	Annual	0.0004	40	0.001%	-	-	-	Negligible
PM_{2.5}	Annual	0.0004	20	0.002%	-	-	-	Negligible
SO₂	15 minutes	42.6	266	16.0%	7.4	57.3 ²	28.7%	Slight (adverse)
	1 hour	28.9	350	8.3%	-	-	-	Negligible
	Daily	15.7	125	12.6%	-	-	-	Slight (adverse)
CO	8 hours	14.9	10000	0.1%	7.4	30.5 ²	15.2%	Negligible

Notes:

¹ PEC and background concentrations only shown where the maximum adverse impact cannot be screened as negligible (>1% long-term or >10% short-term standard).

² Background concentrations for short-term averaging periods have been doubled.

Table 5-15 - Maximum ground level UHC concentrations across the Study Area

Pollutant	Averaging time	With Proposed Scheme Max Mean PC ($\mu\text{g}/\text{m}^3$)	Air Quality Standard ($\mu\text{g}/\text{m}^3$)	Max Adverse as % of Standard
UHC ¹	Annual	0.7	5	14.9%
¹ UHC modelled as benzene and assessed against the benzene annual mean standard.				

Potential Effects on Ecological Receptors

- 5.9.69. In this section, the contribution of the Proposed Scheme to air pollution are presented as maximum ground level concentrations and deposition levels at the identified designated sites.
- 5.9.70. The full results of the SAF Plant modelling at the Operational Phase are provided in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

Nitrogen Oxides

- 5.9.71. The maximum modelled PC annual mean concentrations of NO_x at each designated site, based on five years of meteorological data are presented in **Table 5-16**. Impacts of the Proposed Scheme which cannot be screened out as being insignificant ($>1\%$ of the relevant level or load) are shown in **bold**. Where impacts of the Proposed Scheme cannot be screened out as negligible, the background concentration and PECs have been reported.
- 5.9.72. For LWS and LNR designated sites, the screening criteria applied are exceeded if the short- or long-term impacts are 100% of the environmental standard for conservation areas. None of the assessed LWS or LNR sites exceed this criteria and can therefore be screened out of further assessment.
- 5.9.73. For the remaining designated ecological sites, the impacts of the operation of the Proposed Scheme on annual mean and daily mean concentrations of NO_x are **insignificant** ($\leq 1\%$ of the CLe) at all but the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar designated site.
- 5.9.74. For annual mean NO_x , the air quality impact of the Proposed Scheme at Teesmouth and Cleveland Coast SPA, SSSI, Ramsar equates to $1.0\mu\text{g}/\text{m}^3$ which is 3.4% of the CLe. For daily mean NO_x , the modelled maximum concentration within Teesmouth and Cleveland Coast SPA, SSSI, Ramsar is $16.7\mu\text{g}/\text{m}^3$ (22.2% of the CLe).
- 5.9.75. The background concentrations of NO_x at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar exceed the CLe without the addition of the Proposed Scheme and, as such, the contribution of the Proposed Scheme is minimal compared to the background concentrations. For this preliminary assessment, fixed stack heights have been modelled with a precautionary estimate of pollutant mass emissions and, for some sources, the use of mass concentration at environmental permit limits (**Appendix 5C: Point Source Modelling Assessment (Volume 3)**). These model parameters will be reviewed at the ES

stage with evolved design information, and stack height sensitivity testing will be undertaken. The preliminary result at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar is therefore precautionary and expected to be lower at the ES stage.

- 5.9.76. However, significant effects at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar resulting from NO_x cannot be screened out and the preliminary results of the assessment are reported within **Appendix 7B: Habitats Regulations Assessment Screening Report (Volume 3)** and/or **Chapter 8: Freshwater and Marine Ecology (Volume 1)** of this PEIR.

Table 5-16 - Modelled Maximum Operational Phase Impacts at Ecological Receptors for Annual Mean and Daily Mean NO_x

Receptor	Critical Level (µg/m ³)		Max Proposed Scheme Impact (µg/m ³)		Impact as % of CLe		Max Proposed Scheme PEC (µg/m ³) ¹		Max PEC as % of CLe ¹	
	Annual Mean NO _x	Daily Mean NO _x	Annual Mean NO _x	Daily Mean NO _x	Annual Mean NO _x	Daily Mean NO _x	Annual Mean NO _x	Daily Mean NO _x	Annual Mean NO _x	Daily Mean NO _x
Teesmouth & Cleveland SPA, SSSI, Ramsar	30	75	1.0	16.7	3.4%	22.2%	45.1	91.9	150.3%	122.5%
North York Moors – SPA, SAC, SSSI	30	75	<0.1	0.4	0.1%	0.5%	-	-	-	-
Durham Coast – SAC, SSSI	30	75	<0.1	0.6	0.1%	0.7%	-	-	-	-
Northumbria Coast – SPA, Ramsar	30	75	<0.1	0.4	0.1%	0.6%	-	-	-	-
Briar Croft Pasture - SSSI	30	75	<0.1	0.5	0.1%	0.7%	-	-	-	-
Hart Bog - SSSI	30	75	<0.1	0.4	0.1%	0.5%	-	-	-	-
Hulam Fen - SSSI	30	75	<0.1	0.3	0.1%	0.4%	-	-	-	-
Lovell Hill Pools - SSSI	30	75	<0.1	0.5	0.1%	0.7%	-	-	-	-
Pike Whin Bog - SSSI	30	75	<0.1	0.4	0.1%	0.5%	-	-	-	-
Saltburn Gill - SSSI	30	75	<0.1	0.4	0.1%	0.5%	-	-	-	-
Whitton Bridge Pasture - SSSI	30	75	<0.1	0.7	0.1%	0.9%	-	-	-	-
Berwick Hills - LNR	30	75	0.1	1.9	0.4%	2.5%	-	-	-	-
Cowpen Bewley Woodland Country Park - LNR	30	75	0.1	1.7	0.2%	2.2%	-	-	-	-
Berwick Hills and Ormesby Beck Complex - LWS	30	75	0.1	1.9	0.4%	2.5%	-	-	-	-
Greatham Creek North Bank Saltmarsh - LWS	30	75	0.3	2.5	0.8%	3.4%	-	-	-	-
Greenabella Marsh - LWS	30	75	0.2	2.2	0.6%	2.9%	-	-	-	-
Teessaurus Park - LWS	30	75	0.1	2.0	0.3%	2.7%	-	-	-	-

Notes:

¹ PEC and background concentrations only shown where the maximum adverse impact cannot be screened as negligible.

Sulphur Dioxide

- 5.9.77. The maximum modelled PC annual mean concentrations of SO₂ at each designated site, based on five years of meteorological data are presented in Table 5-17. Impacts of the Proposed Scheme which cannot be screened out as being insignificant (>1% of the relevant level or load) are shown in bold. Where impacts of the Proposed Scheme cannot be screened out as negligible, the background concentration and PECs have been reported.
- 5.9.78. The impacts of the operation of the Proposed Scheme on annual mean concentrations of SO₂ are insignificant ($\leq 1\%$ of the critical level) at all of the assessed designated sites where CLe for SO₂ are available. The impact of SO₂ from the Proposed Scheme on designated sites can therefore be screened as Negligible (Not Significant).

Table 5-17 - Modelled Maximum Operational Phase Impacts at Ecological Receptors for Annual Mean SO₂

Receptor	Critical Level (µg/m³)	Max Proposed Scheme Impact (µg/m³)	Impact as % of CLe	Max Proposed Scheme PEC (µg/m³)¹	Max PEC as % of CLe¹
Teesmouth & Cleveland SPA, SSSI, Ramsar	-	-	-	-	-
North York Moors – SPA, SAC, SSSI	10	<0.1	<0.1%	-	-
Durham Coast – SAC, SSSI	10	<0.1	0.1%	-	-
Northumbria Coast – SPA, Ramsar	-	-	-	-	-
Briar Croft Pasture - SSSI	20	<0.1	<0.1%	-	-
Hart Bog - SSSI	10	<0.1	<0.1%	-	-
Hulam Fen - SSSI	20	<0.1	<0.1%	-	-
Lovell Hill Pools - SSSI	20	<0.1	<0.1%	-	-
Pike Whin Bog - SSSI	10	<0.1	<0.1%	-	-
Saltburn Gill - SSSI	10	<0.1	0.1%	-	-
Whitton Bridge Pasture - SSSI	20	<0.1	<0.1%	-	-
Berwick Hills - LNR	-	-	-	-	-
Cowpen Bewley Woodland Country Park - LNR	-	-	-	-	-
Berwick Hills and Ormesby Beck Complex - LWS	-	-	-	-	-
Greatham Creek North Bank Saltmarsh - LWS	-	-	-	-	-
Greenabella Marsh - LWS	-	-	-	-	-
Teessaurus Park - LWS	-	-	-	-	-

Notes:

¹ PEC and background concentrations only shown where the maximum adverse impact cannot be screened as negligible.

Nitrogen and Acid Deposition

- 5.9.79. The maximum modelled PC annual nitrogen deposition rates at each designated site, based on five years of meteorological data, are presented in **Table 5-18**. Impacts of the Proposed Scheme which cannot be screened out as being insignificant (>1% of the relevant level or load) are shown in **bold**. Where impacts of the Proposed Scheme cannot be screened out as negligible, the background concentration and PECs have been reported.
- 5.9.80. Screening of the designated sites by the impact of the Proposed Scheme as a percentage of the relevant CLo indicates that all but the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar have a **Not Significant** nitrogen deposition impact.
- 5.9.81. The maximum modelled annual mean nitrogen deposition rate at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar is 0.1kgN/ha/year, which equates to 2.1% of the CLo. However, the background nitrogen deposition rates at Teesmouth and Cleveland Coast SPA, SSSI, Ramsar are three times higher than the CLo without the operation of the Proposed Scheme. As such, the impact of the Proposed Scheme is minimal in comparison to the background deposition rates. Nevertheless, the impact of the Proposed Scheme on nitrogen deposition rates at Teesmouth and Cleveland Coast SPA, SSSI, Ramsar cannot be screened as insignificant, and the preliminary results of the assessment are reported within **Appendix 7B: Habitats Regulations Assessment Screening Report (Volume 3)** and/or **Chapter 8: Freshwater and Marine Ecology (Volume 1)** of this PEIR.
- 5.9.82. The maximum modelled PC annual acid deposition rates at each designated site, based on five years of meteorological data (2019-2023), are presented in **Table 5-19**. Impacts of the Proposed Scheme which cannot be screened out as being insignificant (>1% of the relevant level or load) are shown in **bold**.
- 5.9.83. The impacts of the operation of the Proposed Scheme on annual mean acid deposition rates can be screened as **Not Significant** at all designates sites where CLo for acid deposition are available, with the exception of Teesmouth and Cleveland Coast SPA, SSSI, Ramsar.
- 5.9.84. The maximum modelled acid deposition rate at Teesmouth and Cleveland Coast SPA, SSSI, Ramsar is 0.1keq/ha/year, which equates to 1.2% of the relevant CLo. The impact of the operation of the Proposed Scheme on acid deposition rates at Teesmouth and Cleveland Coast SPA, SSSI, Ramsar cannot be screened as insignificant, and the preliminary results of the assessment are reported within **Appendix 7B: Habitats Regulations Assessment Screening Report (Volume 3)** and/or **Chapter 8: Freshwater and Marine Ecology (Volume 1)** of this PEIR.
- 5.9.85. The impact of the Proposed Development on nitrogen deposition and acid deposition cannot be screened as insignificant at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar. However, for this preliminary assessment, fixed stack heights have been modelled with a precautionary estimate of pollutant mass emissions and, for some sources, the use of mass concentration at environmental permit limits (**Appendix 5C: Point Source Modelling Assessment (Volume 3)**). These model parameters will be

reviewed at the ES stage with evolved design information, and stack height sensitivity testing will be undertaken. The preliminary results at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar are therefore precautionary and expected to be lower at the ES stage.

Summary of Impacts at Ecological Receptors

- 5.9.86. The Teesmouth and Cleveland Coast SPA, SSSI, Ramsar is predicted to experience increases greater than 1% of the CLe for NO_x and 1% of the CLo for N deposition and Acid deposition as a result of the operation of the SAF Plant. The preliminary SAF plant modelling assessment has embedded conservatism which will be reviewed at the ES stage with evolved design information and is likely to result in reduced impact at the Teesmouth and Cleveland Coast SPA, SSSI, Ramsar. Furthermore, protected features within the designation are assumed to be at the boundary, which is a conservative approach because some features may be at distance from the designation boundary. However, for this preliminary assessment stage, the potential for impacts cannot be ruled out and therefore the results have been passed to the project ecologist and are discussed in **Chapter 7: Terrestrial Ecology (Volume 1)**.
- 5.9.87. For designated ecological sites, further sensitivity testing on stack and flare heights will be undertaken at the ES Stage to minimise impacts from the SAF Plant to achieve compliance. Further model analysis will also be undertaken to determine the actual location of peak concentrations in relation to the protected features within the designation.
- 5.9.88. All other assessed designated ecological sites are predicted to have **Negligible (Not Significant)** effects resulting from NO_x and SO₂ and from N and Acid deposition.

Table 5-18 - Modelled Maximum Operational Phase Impacts at Ecological Receptors for Annual Nitrogen Deposition

Receptor	Critical Load (kgN/ha/yr)	Max Proposed Scheme Impact (kgN/ha/yr)	Impact as % of CLo	Max Proposed Scheme PEC (kgN/ha/yr)¹	Max PEC as % of CLo¹
Teesmouth & Cleveland SPA, SSSI, Ramsar	5	0.1	2.1%	15.4	307.3%
North York Moors – SPA, SAC, SSSI	5	<0.1	<0.1%	-	-
Durham Coast – SAC, SSSI	5	<0.1	0.1%	-	-
Northumbria Coast – SPA, Ramsar	5	<0.1	0.1%	-	-
Briar Croft Pasture - SSSI	10	<0.1	<0.1%	-	-
Hart Bog - SSSI	5	<0.1	<0.1%	-	-
Hulam Fen - SSSI	15	<0.1	<0.1%	-	-
Lovell Hill Pools - SSSI	-	-	-	-	-
Pike Whin Bog - SSSI	5	<0.1	<0.1%	-	-
Saltburn Gill - SSSI	15	<0.1	<0.1%	-	-
Whitton Bridge Pasture - SSSI	10	<0.1	<0.1%	-	-
Berwick Hills - LNR	10	<0.1	0.2%	-	-
Cowpen Bewley Woodland Country Park - LNR	10	<0.1	0.1%	-	-
Berwick Hills and Ormesby Beck Complex - LWS	10	<0.1	0.2%	-	-
Greatham Creek North Bank Saltmarsh - LWS	10	<0.1	0.3%	-	-
Greenabella Marsh - LWS	10	<0.1	0.2%	-	-
Teessaurus Park - LWS	10	<0.1	0.1%	-	-
Notes:					
¹ PEC and background concentrations only shown where the maximum adverse impact cannot be screened as negligible.					

Table 5-19 - Modelled Maximum Operational Phase Impacts at Ecological Receptors for Annual Acid Deposition

Receptor	Critical Load (keq/ha/yr)	Max Proposed Scheme Impact (keq/ha/yr)	Impact as % of CLo
Teesmouth & Cleveland SPA, SSSI, Ramsar	4.856	0.1	1.2%
North York Moors – SPA, SAC, SSSI	0.504	<0.1	0.1%
Durham Coast – SAC, SSSI	4.856	<0.1	<0.1%
Northumbria Coast – SPA, Ramsar	1.062	<0.1	0.1%
Briar Croft Pasture - SSSI	5.071	<0.1	<0.1%
Hart Bog - SSSI	0.469	<0.1	0.2%
Hulam Fen - SSSI	-	-	-
Lovell Hill Pools - SSSI	-	-	-
Pike Whin Bog - SSSI	-	-	-
Saltburn Gill - SSSI	2.639	<0.1	0.1%
Whitton Bridge Pasture - SSSI	5.071	<0.1	<0.1%
Berwick Hills - LNR	-	-	-
Cowpen Bewley Woodland Country Park - LNR	-	-	-
Berwick Hills and Ormesby Beck Complex - LWS	-	-	-
Greatham Creek North Bank Saltmarsh - LWS	-	-	-
Greenabella Marsh - LWS	-	-	-
Teessaurus Park - LWS	-	-	-

Operational Phase Fugitive Dust

- 5.9.89. A preliminary qualitative dust assessment has been completed with reference to the IAQM Minerals Dust Guidance²¹. A likely effect relates to fugitive emissions of dust from three operational phase sources which are slag, internal conveying and rail terminal activities. Therefore, the following mitigation measures have been adapted from the operational control measures described in the IAQM Minerals Dust Guidance²¹.
- 5.9.90. Sealed silos will be used to store slag; however, the potential remains for fugitive dust emissions during transfer for all three sources. Fugitive dust emissions will be managed through measures contained within the project Environmental Management Plan adapted from the IAQM Minerals Dust Guidance²¹ which will include but are not limited measures such as:
- Design the Site so that transfer activities are contained using bunds or barriers and are located away from human exposure as possible;
 - Dynamic inspection to inform the need for the application of water sprays;
 - Consideration of timing of transfers based on wind-speed conditions and sustained periods of dry weather; and
 - Cleaning of all road-going vehicles prior to leaving Site where necessary.
- 5.9.91. The effective application of identified necessary mitigation will minimise Operational Phase dust emissions and prevent any significant effects occurring at sensitive receptors. The effects are likely to be **Not Significant**.
- 5.9.92. The measures required will be refined at the ES stage based on detailed design information.

Road Traffic (NO₂, PM₁₀ and PM_{2.5})

- 5.9.93. The potential effects of the Proposed Scheme were assessed by comparing the results of the DS scenario against the DM scenario for the Operational Phase in the opening year (2028). Locations of the receptors and their predicted concentration changes are shown in **Figure 5-15 (Volume 2)**.

Human Health Receptors

- 5.9.94. **Table 5-20** shows the summary of air quality impacts from the Operational Phase in 2028 for the assessed human health receptors. Full details on the modelled receptors can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

^c Section 7.1.3, Tables 4 and 5 of the IAQM Minerals Dust Guidance.

Table 5-20 - Summary of Operational Phase Road Traffic dispersion modelling results for human health receptors

		NO₂	PM₁₀	PM_{2.5}
	Objective (µg/m³)	40	40	20
Maximum Annual Mean Concentrations (µg/m³)	DM (2028)	17.8	14.2	8.0
	DS (2028)	17.8	14.4	8.1
Number of Properties greater than objective value	DM (2028) Exceedances	0	0	0
	DS (2028) Exceedances	0	0	0
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement (decrease in concentrations)	0	0	0
	No Change	6	8	10
	Deterioration (increase in concentrations)	5	3	1
DS-DM (µg/m³)	Max Improvement	<0.1	<0.1	<0.1
	Max Worsening	0.2	0.1	0.1

- 5.9.95. **Table 5-20** shows that for all pollutants modelled, concentrations are not predicted to exceed the air quality objectives at any of the human receptors, either with or without the Proposed Scheme in operation.
- 5.9.96. For each pollutant, the majority of assessed human health receptors are predicted to experience no change in air quality. Five receptors are predicted to experience a worsening in air quality with respect to NO₂ concentrations, three with respect to PM₁₀ and one receptor is predicted to experience worsening of air quality with increased PM_{2.5} concentrations.
- 5.9.97. For NO₂, the maximum worsening (i.e. the largest increase in concentrations) is 0.2µg/m³ at receptor R2 located on the A1185 near Billingham. For R2 the DM NO₂ concentration is 12.2µg/m³ and for DS is 12.4µg/m³, and for R11 the DM NO₂ concentration is 15.7µg/m³ and the DS is 16.0µg/m³, an increase of 0.5% of the annual mean NO₂ air quality standard.
- 5.9.98. For PM₁₀, the maximum worsening is 0.1µg/m³, which occurs at three of the eleven residential receptors. The worsening of 0.1µg/m³ occurs at receptors R2, R3 and R7 (all located on the A1185 near Billingham). Of these receptors, the highest DS PM₁₀ concentration is at R2 (DM 14.2µg/m³ and DS 14.4µg/m³).
- 5.9.99. For PM_{2.5}, only one human health receptor is predicted to experience a worsening in air quality. This is at R2, with a change of 0.1µg/m³ (DM 8.0µg/m³ and DS 8.1µg/m³).

- 5.9.100 In general, receptors located to the south of the Proposed Scheme (along the A178, A1046 and adjacent roads) are predicted to experience no increase in pollutant concentrations. Those receptors located along the A1185 and adjacent roads, are predicted to experience a small worsening in pollutant concentrations as a result of the Operational Phase traffic flows.
- 5.9.101 A judgement of impact significance has been made following the methodology described in **Section 5.5 Significance Criteria**. It is judged that there will be a **Negligible** and **Not Significant** effect on all human receptors prior to the implementation of mitigation measures based on the following assessment results:
- No human receptors are predicted to experience an exceedance of the NO₂, PM₁₀ or PM_{2.5} objectives with or without the Proposed Scheme construction traffic; and
 - The maximum impact is 0.2µg/m³ (NO₂), 0.1µg/m³ (PM₁₀) and 0.1µg/m³ (PM_{2.5}) which are <10% of the AQALs.

Ecological Receptors

Annual Mean NO_x Concentrations

- 5.9.102 The critical level for annual mean NO_x is 30µg/m³. As shown in **Appendix 5E: Detailed Modelling Results (Volume 3)**, in 2028 without the Proposed Scheme in operation, the Teesmouth and Cleveland Coast SPA/SSSI is predicted to experience an exceedance of the NO_x CLe at receptor E5, located at the Seal Sands roundabout. With the addition of the Proposed Scheme, no additional exceedances of the NO_x CLe are predicted at the assessed ecological receptors within the Teesmouth and Cleveland Coast SPA/SSSI.
- 5.9.103 The Cowpen Bewley Woodland Country Park LNR is not predicted to exceed the NO_x annual mean CLe under either the DM or DS scenario in 2028.
- 5.9.104 All of the assessed ecological receptors are predicted to experience a worsening of air quality with the Proposed Scheme in operation in 2028, with increases in the concentration of NO_x as a result of increased development traffic. Of these, receptors E3, E5, E6 and E8 (all within the Teesmouth and Cleveland Coast SPA/SSSI) are predicted to experience an increase in NO_x concentrations greater than 1% of the CLe as a result of the Proposed Scheme.
- 5.9.105 The Teesmouth and Cleveland Coast SPA/SSSI has one receptor which exceeds the CLe, and several receptors which show a change of more than 1% of the CLe with the Proposed Scheme under operation. As such, it cannot be ruled out that potential impacts will be experienced as a result of the Proposed Scheme.
- 5.9.106 As with the Construction Phase road traffic assessment, The preliminary assessment of construction road traffic has embedded conservatism in that a precautionary adjustment factor of 3.0 has been applied. Once scheme-specific air quality monitoring is complete, a bespoke adjustment factor will be determined which is likely to be lower than 3.0 and result in reduced impacts. The sensitive receptors for designated ecological sites in the preliminary assessment are roadside locations where the worst-case impacts will occur,

and where the designated sites are likely to be already degraded from the existing road. The embedded conservatism in the preliminary assessment determines that further assessment is required.

5.9.107 Full details on the modelled receptors for each designated site can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

Annual Mean NH₃ Concentrations

5.9.108 Where applicable, the CLe for NH₃ is 3µg/m³. As shown in **Appendix 5E: Detailed Modelling Results (Volume 3)**, none of the ecological receptors are predicted to experience an exceedance of the NH₃ CLe under either the DM or DS scenario.

5.9.109 For all ecological receptors assessed, there was no predicted change in the NH₃ concentrations. As such, it is unlikely that potential impacts will occur resulting from the additional traffic flows of the Proposed Scheme during the Operational Phase.

Annual Mean N Deposition

5.9.110 As shown in **Appendix 5E: Detailed Modelling Results (Volume 3)**, all of the receptors within the Teesmouth and Cleveland Coast SPA/SSSI and the Cowpen Bewley Woodland Country Park LNR are far in exceedance of the N deposition lower CLo (5kg/ha/yr), both with and without the Proposed Scheme in place.

5.9.111 As a result of the change in traffic flow and behaviour associated with the Operational Phase of the Proposed Scheme, N deposition rates are predicted to increase at all of the assessed ecological receptors. However, only one receptor (E3 located at the Seal Sands roundabout) is predicted to experience a change in excess of 1% of the relevant CLo. N deposition at E3 in the DM is 17.54kg/ha/yr relative to 17.59kg/ha/yr in the DS, a change of 1% of the lower CLo.

5.9.112 The Teesmouth and Cleveland Coast SPA/SSSI shows an exceedance of the CLo and a change of more than 1% of the CLo and, as such, the potential for impacts resulting from the Proposed Scheme cannot be ruled out.

5.9.113 Details on the modelled receptors for each designated site can be found in **Appendix 5E: Detailed Modelling Results (Volume 3)**.

Summary of Impacts at Ecological Receptors

5.9.114 The Teesmouth and Cleveland Coast SPA/SSSI is predicted to experience increases greater than 1% of the CLe for NO_x and 1% of the CLo for N deposition during the Operational Phase. As such, the potential for impacts cannot be ruled out at this stage and therefore the results have been passed to the project ecologist.

5.9.115 Further information on these ecological receptors are reported in **Chapter 7: Terrestrial Ecology (Volume 1)** and/or **Chapter 8: Freshwater and Marine Ecology (Volume 1)**.

5.10. ADDITIONAL DESIGN, MITIGATION AND ENHANCEMENT MEASURES

5.10.1. This section sets out the additional design, mitigation and enhancement measures which are likely to be required to address the air quality effects resulting from the Proposed Scheme. They will continue to be refined and developed as the design evolves, with updates presented in the ES. These measures are intended to supplement the measures described in **Section 5.7** as a result of the preliminary impact assessment findings.

CONSTRUCTION PHASE

5.10.2. Good practice mitigation measures applicable to all construction sites are presented in **Section 5.8**. The preliminary assessment of Construction Phase effects is described in **Section 5.9** and it concluded that the dust risk is moderate adverse. The supplementary measures required to ensure that the impact on human health, amenity and ecological health is insignificant are summarised as follows:

Communications

- Develop and implement a stakeholder communications plan that includes community engagement before work commences onsite; and
- Develop and implement a ODMP as part of the OCoCP, which may include measures to control other emissions, approved by the Local Authority. The ODMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections. The specific measures to be included will be based on the outcomes of the updated assessment at the ES stage.

Monitoring

- Where required, agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences onsite or, if it is a large site, before work on a phase commences.

Operating vehicle/machinery and sustainable travel

- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).

Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as is practicable; and
- Only remove the cover in small areas during work and not all at once.

Measures Specific to Construction

- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- For smaller supplies of fine powder materials, ensure bags are sealed after use and stored appropriately to prevent dust.

Measures Specific to Trackout

- Inspect onsite haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the Site exit, wherever site size and layout permits; and
- Access gates to be located at least 10m from receptors where possible.

Construction Traffic

- **Chapter 16: Traffic and Transport (Volume 1)** sets out the likely construction routes to be used during this phase. Timing of large-scale vehicle movements associated with the delivery and removal of materials to avoid peak hours on the local road network would be beneficial, where practicable.

OPERATION PHASE

5.10.3. To optimise the plant design with respect to air emissions, detailed assessment of emissions from following elements of the SAF production process will be completed at the ES stage:

Stack Design

- Optimisation of stack height and emission velocity based on detailed modelling to be completed in the ES.

5.10.4. Any new air emissions resulting from the optimised design, such as NH₃ slip from selective catalytic reduction, will be assessed at the ES stage.

5.11. MONITORING

5.11.1. Good construction practice necessitates the visual inspection of the construction site as described in **Section 5.8** which should be enhanced with dust flux monitoring agreed with STBC and RCBC as described in **Section 5.10**. This would be secured by condition in the project Code of Construction Practice.

5.11.2. The need for post-consent monitoring for the operational phase will be determined during the assessment of the evolved design at the ES stage.

5.12. RESIDUAL EFFECTS

5.12.1. **Table 5-21:** Air Quality - Summary of Residual Effects summarises the residual effects associated with the Proposed Scheme. Further refinement and completion of elements of the assessment is still required as explained throughout this Chapter. The completed assessment will be presented in the ES.

Table 5-21: Air Quality - Summary of Residual Effects

Description of Effect		Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measures	Residual Effect
Construction Phase					
Construction Phase Fugitive Dust	Dust soiling effects during earthworks, construction and trackout	Human receptors within 350m of the DCO Application Boundary	Minor Adverse (Not Significant)	Further site specific mitigation based on the IAQM dust risk assessment as detailed in Section 5.10 .	Negligible (Not Significant)
	Human health effects during earthworks, construction and trackout	Human receptors within 350m of the DCO Application Boundary	Minor Adverse (Not Significant)		Negligible (Not Significant)
	Ecological effects during earthworks, construction and trackout	Ecological receptors within 50m of the DCO Application Boundary	Minor Adverse (Not Significant)		Negligible (Not Significant)
NRMM Emissions		NRMM emissions are not expected to be significant but an assessment of NRMM and construction road traffic will be presented in the Air Quality Chapter of the ES.			
Construction Road Traffic Emissions	Human Receptors	Selected human receptors within 200m of the ARN	Negligible (Not Significant)	Not required	Negligible (Not Significant)

Description of Effect		Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measures	Residual Effect
	Ecological Receptors	Selected ecological receptors within 200m of the ARN	The results of the assessment can be found in Chapter 7: Terrestrial Ecology (Volume 1) .		
Operational Phase					
Emissions of Pollutants arising from the SAF Plant	Human Receptors	Human Receptors within 2km and gridded receptors within 10km	Negligible (Not Significant) for all pollutants except the following pollutants for which the impact is judged to be: <ul style="list-style-type: none"> ■ NO₂ annual: Minor Adverse (Not Significant) ■ NO₂ 1-hour: Minor Adverse (Not Significant) ■ SO₂ 15-minute: Minor Adverse (Not Significant) ■ SO₂ 24-hour: Minor Adverse (Not Significant) UHC annual has been assessed against the Benzene standard. The significance of the UHC impact will be deferred to the ES.		
	Ecological Receptors	Ecological Receptors within 15km	The results of the assessment can be found in Chapter 7: Terrestrial Ecology (Volume 1) .		
Operational Phase Fugitive Dust		Fugitive Dust emissions are not expected to be significant but an assessment will be presented in the Air Quality Chapter of the ES.			
Operational Road Traffic Emissions	Human Receptors	Human Receptors within 200m	Negligible (Not Significant)	Not required	Negligible (Not Significant)
	Ecological Receptors	Ecological Receptors within 200m	The results of the assessment can be found in Chapter 7: Terrestrial Ecology (Volume 1) .		

Description of Effect	Sensitive Receptor	Significance of Effect with Embedded Mitigation	Additional Design, Mitigation, Enhancement Measures	Residual Effect
	Ecological Receptors	Ecological Receptors within 15km		
Rail Terminal and Rail Line Emissions	Screening and potential assessment of these aspects will be presented in the Air Quality Chapter of the ES.			

5.13. NEXT STEPS

5.13.1. Further work to be completed for the ES will include the refinement of the assessment based on relevant responses to the contents of this PEIR by statutory environmental bodies and the provision of detailed design information to justify scoping out non-significant effects. The additional assessment work will include:

BASELINE CONDITIONS

- Conclusion of the baseline air quality monitoring survey.
- Update to baseline information, where necessary, based on any new or revised project-specific, local and/or national datasets and reports.

CONSTRUCTION PHASES

- Update to the assessment of likely impacts and significant effects associated with the Construction Phase air quality assessment. The updated assessment to be presented in the ES will follow the updated IAQM guidance and will be based on evolved design information relating to potential dust generating activities within the Site Boundary and the number and type of NRMM to be employed on Site.
- Updated AADT screening of modelled Construction Phase traffic flow data based on evolved design information to determine the requirement, or otherwise, of an update to the detailed modelling of Construction Phase road traffic emissions (NO₂, PM₁₀ and PM_{2.5}). If an update is required, the model will be re-configured with the latest evolved design information and a bespoke factor will be determined from scheme-specific monitoring for the model verification.

OPERATION PHASE

- Update of the detailed dispersion modelling of the Operational Phase emissions from evolved design SAF production process to assess the air quality impact on sensitive human and ecological receptors. Further sensitivity testing on stack and flare heights will be undertaken to minimise impacts from the SAF Plant to achieve compliance. For designated ecological sites, further model analysis will be undertaken to determine the actual location of peak concentrations in relation to the protected features within the designation.
- Further screening of estimated Operational Phase AADT based on detailed design traffic data with the evolved design information, and update of the detailed road traffic modelling (NO₂, PM₁₀ and PM_{2.5}), if required. If an update is required, as for the Construction Phase traffic assessment, the model will be re-configured and re-verified.
- The impact of locomotive emissions will be assessed following the guidance provided in LAQM.TG(22)²². The detailed design information provided at the ES stage will be screened, and where the screening criteria are met, detailed

dispersion modelling will be completed following a methodology adapted from the assessment of road transport emissions.

- Where required, detailed dispersion modelling of marine vessel emissions of NO₂, PM₁₀ and PM_{2.5} where the LAQM.TG(22)²² criterion is met and/or the assessment deemed necessary.
- Refinement and further description of required mitigation after the completion of the ES assessment including provision of information on the design of a leak detection programme.
- A cumulative impact assessment focusing on Operational Phase impacts at sensitive human and ecological receptors will be undertaken to determine the likely impacts and significance of effects associated with emissions from the Proposed Scheme in combination with projects not yet consented or constructed. This will specifically include the NZT project. Other relevant projects to include in the cumulative impact assessment will be determined in consultation with relevant local planning authorities. This will be reported in **Chapter 19: Cumulative Effects (Volume 1)**.
- Professional judgement will be used to determine the requirement, or otherwise, for in-combination effects from locomotive, marine vessel and road traffic movements, and the SAF plant in locations where these emissions are likely to coincide.

5.14. LIMITATIONS AND ASSUMPTIONS

5.14.1. The following limitations and assumptions have been identified.

BASELINE CONDITIONS

5.14.2. The baseline information that has been collated and used in the assessment has been based on the most up to date information currently available at the time of writing.

CONSTRUCTION PHASE ASSESSMENT

5.14.3. The final design of construction activities and plant was not available for this PEIR. It is assumed that dump trucks, tracked excavators, diesel generators, asphalt spreaders, rollers, compressors and trucks will be utilised during construction of the Proposed Scheme.

5.14.4. Given the results of the qualitative construction dust risk assessment, associated mitigation measures, and the review of receptors and baseline air quality conditions within the Construction Phase Study Area, the outcomes of the preliminary assessment of likely impacts and significance is unlikely to change once the aforementioned construction activity is incorporated.

5.14.5. Provisional flows of construction traffic on public highways have been screened for this assessment with some links meeting the screening criteria. Detailed dispersion modelling of the road traffic has been completed for those links meeting the screening

criteria. Refined traffic flows and proposed construction routes are expected to be made available for consideration in the ES Air Quality Chapter.

OPERATIONAL PHASE ASSESSMENT

- 5.14.6. Provisional flows of operational traffic on public highways have been screened for this assessment and detailed dispersion modelling has been undertaken for those road links that meet the screening criteria. It is expected that more refined flow data will be provided in the ES for further screening and an updated detailed modelling assessment, if required.
- 5.14.7. Provisional emissions data has been provided for seven source points within the SAF Plant, for which detailed dispersion modelling has been undertaken to assess potential impacts at human health receptors and at designated ecological sites. Further refinement of the modelling is being undertaken and will be presented at the ES stage.

5.15. REFERENCES

- ¹ The Planning Inspectorate. (2023). Scoping Opinion: Proposed Lighthouse Green Fuels Project. <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010150/EN010150-000012-EN010150%20-%20Lighthouse%20Green%20Fuels%20-%20Scoping%20Opinion.pdf>
- ² Department for Energy Security and Net Zero (2023) Overarching National Policy Statement for Energy (EN-1). [https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-](https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1)
- ³ Ministry of Housing, Communities & Local Government (2023) National Planning Policy Framework. <https://www.gov.uk/government/publications/national-planning-policy-framework--2>
- ⁴ Department for Environment Food and Rural Affairs (Defra) (2007) The Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland. <https://www.gov.uk/government/publications/the-air-quality-strategy-for-england-scotland-wales-and-northern-ireland-volume-1>
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