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Abbreviations

Abbreviation	In full
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
APIS	Air Pollution Information Service
ARN	Affected Road Network
BHD	Backhoe Dredger
CAZ	Clean Air Zone
CERC	Cambridge Environmental Research Consultants
CEMP	Construction Environmental Management Plan
DM	Do Minimum
DS	Do Something
DWT	Deadweight Tonnage
ECA	Emissions Control Area
EFT	Emissions Factor Toolkit
EPUK	Environmental Protection UK
ES	Environmental Statement
GHG	Greenhouse Gas
HDV	Heavy Duty Vehicle
HFO	Heavy Fuel Oil
IAQM	Institute of Air Quality Management
IMO	International Maritime Organisation
kph	Kilometres per hour
kW	Kilowatt
LDV	Light Duty Vehicle
LNR	Local Nature Reserve
NRMM	Non-Road Mobile Machinery
NRA	Navigation Risk Assessment
NH ₃	Ammonia
NO _x	Oxides of nitrogen
NO ₂	Nitrogen dioxide
OS	Ordnance Survey
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM	Particulate Matter
SFOC	Specific Fuel Oil Consumption

SO ₂	Sulphur dioxide
SPA	Special Protection Area
SSSI	Special Site of Scientific Interest
STBC	Stockton-on-Tees Borough Council

1 Introduction

1.1 Overview

- 1.1.1 Emissions to air during the construction of the Proposed Development have the potential to adversely affect human health and sensitive ecosystems, if not appropriately controlled. Emissions associated with the construction phase could give rise to potential localised air quality effects from dust generated during construction activities and emissions from construction road and shipping traffic during the construction period.
- 1.1.2 This Technical Appendix accompanies **Chapter 8: Air Quality (Environmental Statement (ES) Volume I, Application Document Ref. 6.1)** and describes in detail the qualitative assessment of construction dust from the Proposed Development. Based on the level of risk identified, it proposes appropriate control measures to address the potential dust impacts and effects of the Proposed Development on air quality during construction.
- 1.1.3 The appendix also describes the assessment of construction traffic and shipping emissions using dispersion modelling. The model input parameters are discussed and full results presented to determine the impacts and effects of traffic and shipping emissions as a result of the construction of the Proposed Development.
- 1.1.4 Emissions to air from the Proposed Development during operation, comprising emissions from the operational traffic, shipping and industrial plant, are covered in **Appendix 8B: Operational Air Quality Assessment (ES Volume III, Application Document Ref. 6.3)**.
- 1.1.5 The magnitude of air quality impacts at sensitive human receptors has been quantified where appropriate for pollutants emitted from construction activities associated with the Proposed Development. The impact of emissions on sensitive ecological receptors has also been considered, where relevant, in the context of relevant critical levels or critical loads for designated nature sites.

2 Scope

2.1 Construction phase emissions

- 2.1.1 The assessment has considered the impact of emissions during the construction of the Proposed Development on local air quality.
- 2.1.2 The assessment includes a review of the impacts of dust emissions from the various activities associated with the construction phase of the Proposed Development during planned construction works on Site and the impacts associated with the emissions from construction road and shipping traffic. Impacts on sensitive human and ecological receptors in the vicinity of the Proposed Development have been assessed.
- 2.1.3 The purpose of undertaking an assessment of the construction phase including construction dust, construction traffic and construction shipping is to determine the potential risk of impacts occurring at sensitive receptors due to construction related activities.
- 2.1.4 Determining the potential level of risk for impacts to occur, enables the scale of the mitigation and control measures required to be implemented to avoid the potential impacts being realised. Thereby ensuring there will be no significant impacts at sensitive receptors beyond the Proposed Development.
- 2.1.5 These measures are then secured within a Construction and Environmental Management Plan (CEMP), a framework for which (fCEMP) is provided in **Appendix 5A (ES Volume III, Application Document Ref. 6.3)**; full details on the construction activities and methods proposed are provided within **Chapter 5: Construction Programme and Management (ES Volume I, Application Document Ref. 6.1)**.

2.2 Cumulative impacts

- 2.2.1 Cumulative impacts from existing sources of pollution in the area are accounted for in the adoption of site-specific background pollutant concentrations from archived and published sources. It is recognised, however, that there is a potential impact on local air quality from other consented emission sources which were not present at the time of publication.
- 2.2.2 The list of short-listed cumulative schemes considered for the Proposed Development is presented in **Chapter 22: Cumulative and Combined Effects (ES Volume I, Application Document Ref. 6.1)**.
- 2.2.3 The methodology to determine the growth in traffic on the local road network is described in **Chapter 18: Traffic and Transportation (ES Volume I, Application Document Ref. 6.1)**. Due to limited traffic

assignment detail being provided for certain developments and/or the developments falling outside of the area of influence for the Proposed Development, the predicted growth included in the traffic data does not account for increases in traffic associated with other committed developments in the area. Any traffic associated with the sites in **Chapter 22: Cumulative and Combined Effects (ES Volume I, Application Document Ref. 6.1)** is assumed to be incorporated within the background growth applied to the 2024 baseline flows.

- 2.2.4 As such, the air quality assessment of road traffic emissions is considered to be inherently cumulative. Therefore, there is no separate assessment of cumulative impacts of construction traffic related emissions to air.

2.3 Sources of information

- 2.3.1 The information that has been used within this assessment includes pertinent information from:

- **Chapter 4: Proposed Development (ES Volume I, Application Document Ref. 6.1);**
- **Chapter 5: Construction Programme and Management (ES Volume I, Application Document Ref. 6.1);**
- details on the site layout;
- Ordnance Survey (OS) mapping;
- construction traffic data generated by Arup transport consultants (**Appendix 18B, ES Volume III, Application Document Ref. 6.3**);
- construction shipping movements data from the Navigation Risk Assessment (NRA) which is outlined in **Chapter 20: Marine Navigation (ES Volume I, Application Document Ref. 6.1)**; and
- baseline air quality data from published sources and Local Authorities, detailed within this Appendix.

3 Assessment methodology

3.1 Overview

3.1.1 This section describes the approach that has been taken for the assessment of emissions associated with the construction phase of the Proposed Development which has included:

- qualitative assessment of construction dust effects; and
- dispersion modelling of construction phase road traffic emissions on local roads and shipping emissions.

3.1.2 The impacts of Non-Road Mobile Machinery (NRMM) is considered within **Chapter 8: Air Quality (ES Volume I, Application Document Ref. 6.1)**.

3.2 Study area

3.2.1 The study areas for the assessments have been defined according to the appropriate guidance for the type of assessment being carried out (i.e. construction dust and NRMM and construction traffic. Therefore, the study areas vary for the individual assessment methodologies. Figures showing the relevant study areas are provided in **Figure 8.2 to Figure 8.5 (ES Volume II, Application Document Ref. 6.2)**.

3.2.1.1 The study area for the construction dust and NRMM emissions has been applied in line with the Institute of Air Quality Management (IAQM) guidance [Ref 1], extending:

- up to 250m beyond the Proposed Development and 50m from the construction traffic routes (up to 250m from the site entrance), for human health receptors; and
- up to 50m from the Proposed Development and construction traffic route (up to 250m from the site entrance) for ecological receptors.

3.2.2 The study area for the traffic assessment is defined in the screening criterion set out in the Environmental Protection UK (EPUK)/IAQM guidance [Ref 2], which states that only properties and habitat sites within 200m of the Affected Road Network (ARN) (roads that experience a change in traffic flow above the EPUK/IAQM screening criteria should be considered in road traffic emissions assessments. Information on the EPUK/IAQM screening criteria is outlined below in Section 3.4.

3.2.3 The study area for the construction shipping emissions is defined following guidance outlined in the Local Air Quality Management (LAQM) Technical Guidance (TG(22)) [Ref 4], which states that an assessment of shipping emissions may be required where the following occurs:

- More than 5,000 large ship movements per year, with relevant exposure within 250m of the berth and main areas of manoeuvring; or
 - More than 15,000 large ship movements per year, with relevant exposure within 1km of these areas.
- 3.2.4 Large ships are defined as cross-channel ferries, roll on-roll off ships, bulk cargo, container ships, cruise liners, etc – one ship generating two movements (arrival and departure) [Ref 4].
- 3.2.4.1 Therefore, a study area up to 1km from the defined shipping route and quay area has been used in this study. The shipping route has been defined as the length of the River Tees from the mouth of the river towards the Proposed Development's quay area to account for sources of emissions and manoeuvring vessels.
- 3.3 Construction dust assessment**
- 3.3.1 The following four potential activities have been screened as potentially significant, based on the nature of construction activities proposed within the Proposed Development:
- demolition (hardstanding demolition waste);
 - earthworks (soil stripping, spoil movement and stockpiling);
 - construction (including on-site, piling, concrete batching, foundation digging, trenching); and
 - trackout (heavy-duty vehicle (HDV) movements on unpaved roads and offsite mud on the highway).
- 3.3.2 The area that consisted of the former INEOS Nitriles site has already been cleared to concrete, and therefore it is not considered that there will be any major demolition associated with the Main Site area of the Proposed Development. There may still be the requirement for this concrete to be removed and crushed to be re-used as part of site preparation. However, the main demolition works will be associated with the existing jetties to the east alongside hardstanding and voids below ground level.
- 3.3.3 It is understood that site clearance works would be required as part of the site preparation activities associated with the construction of the Proposed Development. Such site clearance works are not explicitly contained in the IAQM Guidance on the assessment of dust from demolition and construction [Ref 1], and for the purposes of this assessment, the closest assessment category available in the IAQM 2024 guidance is considered to be 'Demolition'. For this reason, term 'Demolition' is used throughout the

remainder of the report to refer to site clearance and potential demolition, and that activity is screened in.

- 3.3.4 Further details of anticipated construction activities and the potential timelines are available within **Chapter 5: Construction Programme and Management (ES Volume I, Application Document Ref. 6.1)**.

Magnitude definitions

- 3.3.5 The potential magnitude of dust emissions is categorised as detailed in Table 3.1 (as provided in the IAQM guidance).

Table 3.1 Definitions of the magnitude of construction/demolition activities

Magnitude	Demolition	Earthworks	Construction	Trackout
Large	Total building volume >75,000m ³ , potentially dust construction material (e.g. concrete), on-site crushing and screening, demolition activities >12m above ground level	Site area >111,000m ² potentially dusty soil type (e.g. clay). >10 heavy earth moving vehicles at once, bunds >6m high	Total building volume >75,000 m ³ , on-site concrete batching, sandblasting	>50 HDV (>3.5 tonne) outward movements in any one day, potentially dusty surface material, unpaved road length >100m
Medium	Total building volume 12,000 – 75,000 m ³ , potentially dusty construction material, demolition activities 6 to 12 metres above ground level	Site area 18,000 – 110,000m ² , moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles at once, bunds 3-6 metres high	Total building volume 12,000 – 75,000m ³ , potentially dusty materials e.g. concrete, on-site concrete batching	20 - 50 HDV outward movement in any one day, moderately dusty surface material, unpaved road length 50m - 100m
Small	Total building volume <12,000m ³ , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 metres above ground level, demolition during wetter months	Site area <18,000m ² , large grain soil type (e.g. sand), <5 heavy earth moving vehicles at once	Total building volume <12,000m ³ , low dust potential construction materials. e.g. metal/timber	<20 HDV outward movement in any one day, surface material with low potential for dust release, unpaved road length <50m

Receptor sensitivity definitions

- 3.3.6 The assessment of the significance of the effects of construction dust has been made with respect to the receptor and area sensitivity definitions as

outlined in Table 3.2. Sensitivity definitions have been made with reference to the IAQM guidance [Ref 1].

- 3.3.7 To ensure a worst-case scenario is assessed, the construction dust assessment has been based on the extent of the entire Proposed Development, which includes the Main Site as well as the access and utility corridors.
- 3.3.8 There are 10 - 100 residential receptors within 250m from the Proposed Development defined as high sensitivity receptors to construction impacts, along Broadway West and Wilton Avenue (Dormanstown). There are also 1 - 10 receptors within 250m of the Proposed Development defined as moderate sensitivity to construction impacts, including the World of Play – Children’s Amusement Centre on West Coatham Lane (Dormanstown) alongside further office buildings in the Grangetown port area, across the River Tees.
- 3.3.9 Although these receptors are located within 250m of the Proposed Development, it is unlikely that any construction works such as earthworks, demolition or construction would be undertaken within 250m of these receptors. It is intended that this part of the Proposed Development would only be utilised for Heavy Goods Vehicle (HGV) access. However, there could still be impacts from trackout from the vehicle movements.
- 3.3.10 Regarding ecological receptors, the nearest ecological receptor to the Proposed Development is the Teesmouth and Cleveland Coast, which is subject to multiple designations as a Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI). The closest points of this receptor are within 20m of the Proposed Development boundary and therefore, as a worst-case scenario, it has been considered to be highly sensitive to construction impacts due to its close proximity to the Proposed Development.
- 3.3.11 There are no further ecological receptors within the 50m screening distance from the Proposed Development. An assessment of construction dust impacts on the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI has therefore been carried out.

Table 3.2 Receptor sensitivity to construction/demolition dust effects

Potential dust effect	Human perception of dust soiling effects	PM ₁₀ health effects	Ecological effects
High sensitivity	Enjoy a high level of amenity ^a ; the appearance, aesthetics or value of the property would be diminished by soiling; receptor	Public present for 8 hours per day or more; e.g. residential properties, schools, care homes, hospitals.	Locations with an international or national designation and the designated features may be affected by dust soiling; locations where

Potential dust effect	Human perception of dust soiling effects	PM ₁₀ health effects	Ecological effects
	expected to be present continuously or regularly for extended periods of time; e.g. residential dwellings, museums, culturally important collections, medium and long-term car parks and showrooms.		there are a community of a particularly dust sensitive species such as vascular species included in the Red Data List for Great Britain.
Moderate sensitivity	Enjoy a reasonable level of amenity ^a ; the appearance, aesthetics or value of the property could be diminished by soiling; receptor not expected to be present continuously or regularly for extended periods of time; e.g. parks and places of work.	Only workforce present (no residential or high sensitivity receptors) 8-hours per day or more; e.g. office and shop workers.	Locations where there is a particularly important plant species, where dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition.
Low sensitivity	Enjoyment of amenity ^a is not reasonably expected; the appearance, aesthetics or value of property not diminished by soiling; receptors are transient or present for limited periods of time; e.g. playing fields, farmland, footpaths, short term car parks ^b .	Transient human exposure, e.g. footpaths, playing fields and parks.	Locations with a local designation which may be affected by dust deposition.
^a People's expectations will vary depending on the existing dust deposition in the area. ^b Car parks can have a range of sensitivities depending on the duration and frequency that people would be expected to park their cars there, and the level of amenity they could reasonably expect whilst doing so. Car parks associated with work place or residential parking might have a high level of sensitivity compared to car parks used less frequently and for shorter durations, such as those associated with shopping. Cases should be examined on their own merits.			

3.3.12 Distances have been measured from source to receptor in bands of less than 20m, less than 50m, less than 100m and less than 250m for demolition, earthworks and construction in accordance with the IAQM guidance [Ref 1]. For trackout, the receptor distances have been measured from receptor to trackout route (up to 50m) and up to 250m from the construction site exit. These distance bands have been applied in Table 3.3 and Table 3.4.

3.3.13 Figures showing the relevant construction dust buffers are provided in **Figure 8.2: Construction Dust Buffers (ES Volume II, Application Document Ref. 6.2).**

Table 3.3 Sensitivity of the area to dust soiling effects on people/property

Receptor sensitivity	Number of receptors	Distance from the source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 3.4 Sensitivity of the area to human health impacts

Receptor sensitivity	Annual mean PM ₁₀ concentration	Number of receptors	Distance from the source (m)			
			<20	<50	<100	<250
High	>32 µg/m ³	>100	High	High	High	Medium
		10 - 100	High	High	Medium	Low
		1 - 10	High	Medium	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low
		10 - 100	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low
		1 - 10	Medium	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Medium	>32 µg/m ³	>10	High	Medium	Low	Low
		1 - 10	Medium	Low	Low	Low
	28-32 µg/m ³	>10	Medium	Low	Low	Low
		1 - 10	Low	Low	Low	Low
	24-28 µg/m ³	>10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

3.3.14 For sensitivity of an area to ecological impacts, the distance bands are for less than 20m and less than 50m, which have been applied in Table 3.5.

Table 3.5 Sensitivity of the area to ecological impacts

Receptor sensitivity	Distance from the source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Risk definitions

3.3.15 The potential risks from emissions from unmitigated demolition and construction activities have been defined with reference to the magnitude of the potential emission and the highest sensitivity receptor(s) within the effect area, as summarised in Table 3.6.

Table 3.6 Classification of risk of unmitigated impacts

Receptor sensitivity	Magnitude		
	Large	Medium	Small
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Magnitude assessment

3.3.16 Each dust generating activity has been assigned a dust emission magnitude according to the definitions provided in Table 3.1.

3.3.17 As the construction programme details and design details for the Proposed Development are to be finalised at the detailed design stage, it has been assumed that the dust emission magnitude for all construction activities (demolition, earthworks, construction and trackout) will be large. This assumption represents a worst-case scenario.

Area sensitivity assessment

3.3.18 The area sensitivity to dust soiling and PM₁₀ (human health) has been determined for all activities. This is based on the receptor sensitivity (high, medium or low), the distance to those activities and the background PM₁₀ concentration from the Defra background mapping data [Ref 3].

3.3.19 Based on these criteria, the overall area sensitivity is 'high' for ecological impacts, 'low' for dust soiling impacts and 'low' for human health PM₁₀ impacts. These results are shown below in Table 3.7 for each activity.

Table 3.7 Area sensitivity for receptors of construction dust

Activity	Potential impact	Receptor sensitivity and distance to activity	Area sensitivity ⁱ
Demolition (Site clearance and preparatory works)	Dust soiling	High sensitivity (10 - 100 receptors) <250m	Low
	Health PM ₁₀	High sensitivity (10 - 100 receptors) <250m	Low
	Ecological impact	High sensitivity (Teessmouth and Cleveland Coast SPA, Ramsar and SSSI) <20m	High
Earthworks	Dust soiling	High sensitivity (10-100 receptors) <250m	Low
	Health PM ₁₀	High sensitivity (10-100 receptors) <250m	Low
	Ecological impact	High sensitivity (Teessmouth and Cleveland Coast SPA, Ramsar and SSSI) <20m	High
Construction	Dust soiling	High sensitivity (10-100 receptors) <250m	Low
	Health PM ₁₀	High sensitivity (10-100 receptors) <250m	Low
	Ecological impact	High sensitivity (Teessmouth and Cleveland Coast SPA, Ramsar and SSSI) <20m	High

ⁱ Defined in accordance with Step 2B of IAQM 2024 taking into account the specific sensitivities of receptors in the area; the proximity and number of those receptors; in the case of PM₁₀, the local background concentration; and site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust

Activity	Potential impact	Receptor sensitivity and distance to activity	Area sensitivity ⁱ
Trackout	Dust soiling	High sensitivity (10-100 receptors) <250m	Low
	Health PM ₁₀	High sensitivity (10-100 receptors) <250m	Low
	Ecological impact	High sensitivity (Teessmouth and Cleveland Coast SPA, Ramsar and SSSI) <20m	High

3.3.20 The risk of impacts from each of the unmitigated activities (demolition, earthworks, construction and trackout) have been determined through combination of the potential dust emission magnitude and the sensitivity of the area. These are summarised in Table 3.8.

Table 3.8 Risk of impacts from unmitigated activities

Potential impact	Demolition	Earthworks	Construction	Trackout
Dust soiling (low sensitivity)	Medium risk	Low risk	Low risk	Low risk
Health PM ₁₀ (low sensitivity)	Medium risk	Low risk	Low risk	Low risk
Ecological impacts (high sensitivity)	High risk	High risk	High risk	High risk

3.3.21 The risk assessment for construction dust impacts indicates that the risk is low to medium for human health (PM₁₀) impacts, low to medium for dust soiling impacts and high risk for ecological impacts.

3.3.22 These risk classifications are solely used to select the appropriate schedule of mitigation measures, examples of which are set out in guidance published by the IAQM [Ref 1]. For all but the smallest of sites the use of the high-risk schedule of measures represents good working practice.

3.3.23 On consideration of the likely effectiveness of these measures, additional site-specific measures will be identified in the fCEMP, if required, which may include, as appropriate:

- cutting and grinding operations, if required, will be conducted using equipment and techniques that reduce emissions and incorporate appropriate dust suppression measures;
- damping down of dust-generating equipment and vehicles within the site and the provision of dust suppression in all areas of the site that are likely to generate dust;

- use water suppression and regular cleaning during earth moving activities;
- materials stockpiles likely to generate dust enclosed or securely sheeted, damped down or stabilised as appropriate;
- covering materials, deliveries or loads entering and leaving the construction site;
- mixing of grout or cement-based materials will be undertaken using appropriate techniques/mitigation;
- the surface of the haul routes is to be monitored and maintained;
- enforcement of speed limits on haul roads;
- measures will be taken to keep roads and accesses clean; and
- vehicle, plant and equipment maintenance records will be kept on-site and reviewed regularly.

3.3.24 It is considered that with the implementation of appropriate mitigation and control measures set out in the fCEMP, the potential effect from fugitive emissions of construction dust would not be significant. It should be noted that the IAQM guidance does not assign a significance of effect prior to mitigation.

3.4 Construction road traffic assessment

3.4.1 For the construction road traffic assessment, all potentially affected roads have been assessed at a 'detailed level' of assessment. As detailed in IAQM and Environmental Protection UK (EPUK) Land-use Planning & Development Control: Planning for Air Quality Guidance [Ref 2], a 'detailed level' assessment uses dispersion modelling to predict pollutant concentrations, taking into account additional variables. The detailed assessment of local air quality reported in this Appendix has been undertaken using the Cambridge Environmental Research Consultants (CERC) Atmospheric Dispersion Modelling System (ADMS) Roads dispersion model (version 5.1.0.2) to predict road pollutant contributions at identified sensitive receptors [Ref 5].

Assessment scenarios

3.4.2 Traffic flows have been provided for:

- 2024 baseline scenario;
- 2030 Do Minimum (DM) scenario, which is the future construction year traffic flows without the construction of the Proposed Development; and

- 2030 Do Something (DS) scenario, which is the same as the DM scenario but includes the construction traffic generated by the construction of the Proposed Development.
- 3.4.3 The construction year of 2030 has been modelled as this represents a 'worst-case' traffic scenario for the likely peak construction phase (see **Chapter 18: Traffic and Transportation (ES Volume I, Application Document Ref. 6.1)**). It should be noted that this provides a highly conservative assessment, as traffic during the other three years of the construction period would likely be lower.
- 3.4.4 Air quality is expected to improve as traffic emissions and emissions from other sources progressively decrease across the UK (due to increasing manufacturer efficiency and growing numbers of low/electric vehicles in the fleet mix outweighing any increases in vehicle movements). The baseline year of 2024 has therefore been modelled using 2024 emission factors. Traffic data for 2030 (which includes additional background traffic growth) have been assessed using the 2030 emission factors and background data to assess the construction scenario for the Proposed Development. On the basis of these predictions, the change in key pollutant concentrations (nitrogen dioxide (NO₂), particulate matter (PM₁₀, PM_{2.5}), ammonia (NH₃), nutrient nitrogen and acid deposition) associated with the Proposed Development have been established.
- 3.4.5 Emissions were calculated with the latest Defra Emissions Factor Toolkit (EFT) (version 13.0.1) [Ref 6] and the CREAM (Calculator for Road Emissions of Ammonia) emissions tool (Version 2A) [Ref 7] for the assessment of nitrogen deposition at designated ecological sites within 200m of the modelled road network (Affected Road Network (ARN)), based on the emission of NO_x and NH₃ from the construction road traffic.
- 3.4.6 Further details of the assessment methodology including the inputs used in the ADMS-Roads model (including meteorology data), model post-processing (e.g. nitrogen oxides (NO_x) to NO₂ conversion) and the approach taken to model verification are presented in the following sub-sections.
- 3.4.7 Representative sensitive receptors (e.g. residential properties and ecological sites) have been selected for assessment within the local air quality assessment. These include those sensitive receptors located closest to the Proposed Development and within the study area for construction traffic effects, as defined above in Section 3.2.
- 3.4.8 The predicted air quality impacts of the Proposed Development are evaluated against relevant national, regional and local air quality planning policy. An evaluation of the significance of the local air quality assessment

findings at sensitive receptors for human health has been undertaken in accordance with EPUK/IAQM guidance [Ref 2].

- 3.4.9 Effects at ecological receptors have been assessed in accordance with the method set out in the Environment Agency air emissions risk assessment guidance [Ref 9], which states that the impact of road traffic emissions can be regarded as insignificant at sites with statutory designations if:
- the long-term Process Contribution (PC) is less than 1% of the critical level, or if greater than 1% then the Predicted Environmental Concentration (PEC) is less than 70% of the critical level; and
 - the short-term PC is less than 10% of the critical level.
- 3.4.10 The impact of road traffic emissions can be regarded as insignificant at sites of local importance if:
- the long-term PC is less than 100% of the critical level; and
 - the short-term PC is less than 100% of the critical level.
- 3.4.11 Any ecological receptors that predicted a change in NO_x concentrations or nitrogen deposition of over 1%, compared with the lower critical load, were identified. At the most sensitive ecological receptor locations, transect points up to 200m from the source were modelled at 10m increments to assess the drop-off in NO_x concentrations and nitrogen deposition with increasing distances from the road in line with industry standard practice [Ref 8]. All ecological receptor locations were modelled at a height of 0m to represent ground level.
- 3.4.12 In addition to assessing NO_x, an assessment of the change in NH₃, nitrogen and acid deposition has also been undertaken due to the sensitivity of the ecological sites in the area. The methodology within the Environment Agency air emissions risk assessment guidance [Ref 9], has been followed for these pollutants.

Screening criteria

- 3.4.13 The construction phase traffic assessment considers the impact of emissions associated with additional HDV and Light Duty Vehicles (LDV) introduced to the local road network due to construction work associated with the Proposed Development. This includes those associated with the import and export of materials to and from the Proposed Development and utility corridors and the commuting of contractors.
- 3.4.14 The screening of traffic data has been undertaken using the EPUK/IAQM Land Use and Planning guidance [Ref 2]. The construction ARN is outside the boundary of an Air Quality Management Area [Ref 3] so the following IAQM criteria apply to this area:

- A change of more than 500 Annual Average Daily Traffic (AADT) LDV movements; or
 - A change of more than 100 AADT HDV movements.
- 3.4.15 The construction traffic data shows that there are predicted exceedances of both the AADT LDV and AADT HDV screening criteria along the ARN. Some additional roads where the screening criteria were not exceeded were included in the assessment to provide a wider assessment of local emissions to air.
- [Traffic data](#)
- 3.4.16 Traffic data consists of 24-hour AADT, percentage HDV movements and speeds in kilometres per hour (kph) for all road links. This speed data provided was used in the air quality assessment, with the exception of road links recognised as junctions or roundabouts, where modelled speeds were assumed to be 20kph following Defra's LAQM.TG22 guidance [Ref 4].
- 3.4.17 Vehicle emissions were calculated using Defra's EFT (version 13.1) [Ref 6]. The future year has been assessed using 2030 vehicle emissions to ensure a conservative assessment is carried out. The GIS software, ArcPro was used to assist inputting the road link geographical information into the air quality dispersion model.
- 3.4.18 The road traffic data are provided in Table 3.9 and the modelled ARN is presented in **Figure 8.3** and **Figure 8.4 (ES Volume II, Application Document Ref 6.2)**, alongside the selected sensitive human and ecological receptors.
- 3.4.19 It is important to note that Port Clarence Road (road links 18 and 19) has only been included in the assessment to account for additional LDV movements (vehicles weighing <3.5 tonnes) as a result of the construction of the Proposed Development (i.e. for construction worker access). Port Clarence Road has a <7.5 tonne weight limit, applicable for goods vehicles only. No additional HDV movements on these links are anticipated as a result of the construction of the Proposed Development.

Table 3.9 Road traffic data used in the construction traffic assessment

Road/Link ID	Avg. Speed (kph)	2024 Base			2030 Do-Minimum			2030 Do-Something		
		Total AADT	HDV	HDV (%)	Total AADT	HDV	HDV (%)	Total AADT	HDV	HDV (%)
1	48	4,490	629	14.0	4,662	653	14.0	7,728	1,013	13.1
2	97	8,146	362	4.4	8,459	376	4.4	10,547	376	3.6
3	97	6,911	475	6.9	7,176	493	6.9	7,511	493	6.6
4	97	4,950	986	19.9	5,140	1,024	19.9	5,782	1,384	23.9
5	97	4,950	986	19.9	5,140	1,024	19.9	5,782	1,384	23.9
6	80	4,950	986	19.9	5,140	1,024	19.9	5,782	1,384	23.9
7	64	9,170	228	2.5	9,522	236	2.5	9,629	236	2.5
8	64	13,290	1,612	12.1	13,800	1,674	12.1	14,336	2,034	14.2
9	64	8,211	84	1.0	8,526	87	1.0	8,528	87	1.0
10	64	30,520	1,248	4.1	31,692	1,296	4.1	31,699	1,296	4.1
11	64	3,946	294	7.5	4,098	305	7.4	4,098	305	7.4
13	64	33,563	2,694	8.0	34,852	2,797	8.0	35,307	3,132	8.9
14	64	33,563	2,694	8.0	34,852	2,797	8.0	35,301	3,132	8.9
16	80	19,692	1,688	8.6	20,448	1,753	8.6	20,635	1,890	9.2
17	97	8,146	362	4.4	8,459	376	4.4	10,547	376	3.6
18	48	8,146	362	4.4	8,459	376	4.4	10,543	376	3.6
19	64	8,146	362	4.4	8,459	376	4.4	10,543	376	3.6
31	112	77,571	5,991	7.7	80,550	6,221	7.7	80,746	6,401	7.9
32	64	14,445	1,081	7.5	15,000	1,123	7.5	16,922	1,123	6.6

Road/Link ID	Avg. Speed (kph)	2024 Base			2030 Do-Minimum			2030 Do-Something		
		Total AADT	HDV	HDV (%)	Total AADT	HDV	HDV (%)	Total AADT	HDV	HDV (%)
33	64	14,445	1,081	7.5	15,000	1,123	7.5	16,922	1,123	6.6
35	64	14,445	1,081	7.5	15,000	1,123	7.5	16,871	1,123	6.7
46	64	14,445	1,081	7.5	15,000	1,123	7.5	16,871	1,123	6.7
37	48	18,042	634	3.5	18,735	658	3.5	18,887	658	3.5
38	112	110,155	6,999	6.4	114,385	7,268	6.4	116,084	7,268	6.3
39	64	27,236	958	3.5	28,282	995	3.5	28,305	995	3.5

Dispersion model set up

- 3.4.20 The general model conditions used in the assessment of road traffic emissions are summarised in Table 3.10. Other more detailed data used to model the dispersion of emissions is considered below.

Table 3.10 General ADMS roads model conditions

Variable	Input
Surface roughness at source	0.3m
Minimum Monin-Obukhov length for stable conditions	30m
Receptors	Selected discrete receptors
Receptor location	X, Y co-ordinates determined by GIS. The height of residential receptors will be modelled at 1.5m to represent the height of average human exposure and the ecological receptors are modelled at 0m, representative of ground level
Modelled pollutants	NO _x , PM ₁₀ , PM _{2.5} , NH ₃
Emission factors	Emission Factor Toolkit version 13.1
Meteorological data	1 year of hourly sequential data, Durham Tees Valley Meteorological Station (2024)
Emission profiles	None used – emissions averaged across a 24-hour period
Terrain types	Flat terrain
Model output	Long-term annual mean NO _x concentration (µg/m ³) Long-term annual mean PM ₁₀ concentration (µg/m ³) Long-term annual mean PM _{2.5} concentration (µg/m ³) Long-term annual mean NH ₃ concentration (µg/m ³)

Sensitive receptors

- 3.4.21 A desk-top study was undertaken to identify existing sensitive receptors along the modelled road network. Receptors were chosen at locations where they are likely to experience the greatest potential effect from construction of the Proposed Development.
- 3.4.22 There are five separate ecological sites within 200m of the modelled road network and have therefore been included in the assessment, at locations closest to the modelled roads, which includes the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI site, Cowpen Bewley Woodland Country Park Local Nature Reserve (LNR), Billingham Beck Valley Local Wildlife Site (LWS), A19 Gorse Field (LWS) and Portrack Meadows (LWS). This does not include multiple points for the overlapping designation of the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI site.

- 3.4.23 Due to the scale of the Teesmouth and Cleveland Coast SSSI, SPA and Ramsar sites and the overlapping designations, various receptor points have been included to capture the locations within 200m of the modelled roads, upon which numerous receptor points along a transect have been included.
- 3.4.24 The receptors for which the impact of road traffic emissions will be predicted are listed in Table 3.11 and
- 3.4.25 Table 3.12 for human and ecological receptors respectively. Modelled receptors are presented in **Figure 8.3** and **Figure 8.4 (ES Volume II, Application Document Ref. 6.2)**.

Table 3.11 Modelled human health receptors

Receptor ID	X	Y	Description	Shortest distance to road source (m)
CT001	448225	524996	Residential Property - Cowpen Lane Farm	151
CT002	448062	525341	Residential Property - Cowpen Bewley	83
CT003	447154	525670	Residential Property on Rowlands Grove	46
CT004	447004	525864	Residential Property on Rowlands Grove	16
CT005	446264	526075	Residential Property on Bewholme Close	22
CT006	446096	526021	Residential Property on Dryden Close	28
CT007	445765	525899	Residential Property on Tennyson Road	29
CT008	447237	525539	Residential Property on Wolviston Back Lane	107
CT009	446657	526082	Residential Property on Elvington Close	54
CT010	450050	521621	Residential Property on Saltview Terrace	23
CT011	449565	521885	Residential Property on Port Clarence Road	16
CT012	449470	521964	High Clarence Primary School	9
CT013	449168	522213	Residential Property on Meadowdale Close	17

Receptor ID	X	Y	Description	Shortest distance to road source (m)
CT014	448698	522596	Residential Property on Haverton Hill Hotel	4
CT015	449696	521823	Kingsway Medical Centre	30
CT016	445649	525748	Residential Property on Haydon Grn	43
CT017	445371	525931	Residential Property on Sunderland Rd	40
CT018	445002	525944	Residential Property on Coal Lane	56
CT019	444263	526291	Nursery School Kids 1st - Wynyard	53
CT020	444183	524836	Residential Property on Eden Way	57
CT021	444091	524264	Residential Property on Cranstock Cl	72
CT022	444720	522986	Residential Property on Rook Ln	112

Table 3.12 Modelled ecological receptors for the construction traffic assessment

Receptor ID	X	Y	Description	Shortest distance to road source
CE001	450600	523713	Teesmouth and m Coast SPA, Ramsar, SSSI	Transects at 0 – 200m from the road at 10m increments
CE001_10	450593	523719		
CE001_20	450585	523726		
CE001_30	450577	523732		
CE001_40	450569	523738		
CE001_50	450562	523744		
CE001_60	450554	523751		
CE001_70	450546	523757		
CE001_80	450538	523763		
CE001_90	450531	523770		
CE001_100	450523	523776		
CE001_110	450515	523782		
CE001_120	450507	523789		
CE001_130	450500	523795		
CE001_140	450492	523801		

Receptor ID	X	Y	Description	Shortest distance to road source
CE001_150	450484	523808		
CE001_160	450476	523814		
CE001_170	450469	523820		
CE001_180	450461	523827		
CE001_190	450453	523833		
CE001_200	450446	523838		
CE002	450688	523724	Teesmouth and Cleveland Coast SPA, Ramsar, SSSI	Transects at 0 – 200m from the road at 10m increments
CE002_10	450694	523731		
CE002_20	450701	523739		
CE002_30	450708	523746		
CE002_40	450714	523754		
CE002_50	450721	523761		
CE002_60	450728	523769		
CE002_70	450734	523776		
CE002_80	450741	523784		
CE002_90	450748	523791		
CE002_100	450754	523798		
CE002_110	450761	523806		
CE002_120	450768	523813		
CE002_130	450774	523821		
CE002_140	450781	523828		
CE002_150	450788	523836		
CE002_160	450794	523843		
CE002_170	450801	523851		
CE002_180	450808	523858		
CE002_190	450814	523866		
CE002_200	450821	523873		
CE003	451027	522670	Teesmouth and Cleveland Coast SPA, Ramsar, SSSI	Transects at 0 – 170m from the road at 10m increments
CE003_10	451017	522668		
CE003_20	451007	522666		
CE003_30	450997	522664		
CE003_40	450988	522662		
CE003_50	450978	522660		
CE003_60	450968	522658		
CE003_70	450958	522656		

Receptor ID	X	Y	Description	Shortest distance to road source
CE003_80	450948	522654		
CE003_90	450939	522652		
CE003_100	450929	522650		
CE003_110	450919	522648		
CE003_120	450909	522646		
CE003_130	450899	522644		
CE003_140	450890	522642		
CE003_150	450880	522640		
CE003_160	450870	522638		
CE003_170	450860	522636		
CE004	450186	521692	Teesmouth and Cleveland Coast SPA, Ramsar, SSSI	Transects at 0 – 190m from the road at 10m increments
CE004_10	450184	521702		
CE004_20	450181	521711		
CE004_30	450179	521721		
CE004_40	450177	521731		
CE004_50	450175	521741		
CE004_60	450172	521750		
CE004_70	450170	521760		
CE004_80	450168	521770		
CE004_90	450166	521780		
CE004_100	450163	521789		
CE004_110	450161	521799		
CE004_120	450159	521809		
CE004_130	450157	521819		
CE004_140	450154	521828		
CE004_150	450152	521838		
CE004_160	450150	521848		
CE004_170	450148	521858		
CE004_180	450146	521867		
CE004_190	450143	521877		
CE005	448982	522611	Teesmouth and Cleveland Coast SPA, Ramsar, SSSI	Transects at 0 – 160m from the road at 10m increments
CE005_10	448991	522616		
CE005_20	448999	522621		
CE005_30	449008	522627		
CE005_40	449017	522632		

Receptor ID	X	Y	Description	Shortest distance to road source
CE005_50	449025	522637		
CE005_60	449034	522642		
CE005_70	449043	522647		
CE005_80	449051	522652		
CE005_90	449060	522657		
CE005_100	449068	522662		
CE005_110	449077	522667		
CE005_120	449086	522672		
CE005_130	449094	522677		
CE005_140	449103	522682		
CE005_150	449112	522687		
CE005_160	449120	522692		
CE007	448986	524676	Teesmouth and Cleveland Coast SPA, Ramsar, SSSI	Transects at 0 – 150m from the road at 10m increments
CE007_10	448994	524682		
CE007_20	449002	524687		
CE007_30	449010	524693		
CE007_40	449019	524699		
CE007_50	449027	524704		
CE007_60	449035	524710		
CE007_70	449044	524715		
CE007_80	449052	524721		
CE007_90	449060	524726		
CE007_100	449069	524732		
CE007_110	449077	524738		
CE007_120	449085	524743		
CE007_130	449093	524749		
CE007_140	449102	524754		
CE007_150	449110	524760		
CE008	450639	523536	Teesmouth and Cleveland Coast SPA, Ramsar, SSSI	Transects at 0 – 190m from the road at 10m increments
CE008_10	450630	523531		
CE008_20	450621	523526		
CE008_30	450613	523521		
CE008_40	450604	523516		
CE008_50	450595	523512		
CE008_60	450586	523507		

Receptor ID	X	Y	Description	Shortest distance to road source
CE008_70	450578	523502		
CE008_80	450569	523497		
CE008_90	450560	523492		
CE008_100	450551	523487		
CE008_110	450543	523483		
CE008_120	450534	523478		
CE008_130	450525	523473		
CE008_140	450516	523468		
CE008_150	450508	523463		
CE008_160	450499	523458		
CE008_170	450490	523453		
CE008_180	450481	523449		
CE008_190	450474	523445		
CE009	447971	525275	Cowpen Woodland Park – LNR	16
CE011	444777	523134	Billingham Beck Valley LNR	22
CE013	444176	523790	A19 Gorse Field LWS	22
CE014	447376	519758	Portrack Meadows LWS	30

3.4.26 After consultation with the project ecologist, it was determined that ecological receptors CE006, CE010 and CE012 could be removed from the assessment. CE006 and CE010 were points for Teesmouth and Cleveland Coast designation. However, the location of these points only referred to water habitats so have been removed as critical loads are not applicable to water. CE012 was for the Stockton LWS Gravel Hole Quarry, this site is a former disused quarry, and it was determined by the project ecologist that the Critical Levels and Critical Loads would not apply to this site.

3.4.27 Background deposition information has been gathered for each of the selected sensitive ecological receptors from the Air Pollution Information Service (APIS) website [Ref 10] for NO_x, NH₃, nutrient nitrogen deposition and acid deposition. This has been gathered for each of the transect points for the modelled sensitive ecological receptors up to a maximum distance of 200m from the edge of the nearest road. Information on the selected background concentrations are displayed below in Table 3.13.

- 3.4.28 Where background concentrations are the same across the multiple transect points they have been grouped together and summarised in Table 3.13.

Table 3.13 APIS critical levels and critical loads

Ecological receptor ID	Annual mean NO _x critical level (µg/m ³)	Annual mean NH ₃ critical level (µg/m ³)	Critical load class	N critical load (minimum)	Acid critical load (keq/ha/yr)
CE001 – CE001_200	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00
CE002 – CE002_200	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00
CE003 – CE003_140	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856
CE003_150 CE003_170	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Max S:4.00
CE004 – CE004_180	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856
CE004_190	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Max S:4.00
CE005_ – CE005_10	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856
CE005 – CE005_150	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Max S:4.00
CE005_160	30	3	Coastal Flood Plain Grazing Marsh	10	
CE007	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856

Ecological receptor ID	Annual mean NO _x critical level (µg/m ³)	Annual mean NH ₃ critical level (µg/m ³)	Critical load class	N critical load (minimum)	Acid critical load (keq/ha/yr)
CE007 – CE007_140	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Max N:4.856 Min CL Max S:4.00
CE007_150	30	3	Coastal Flood Plain Grazing Marsh	10	
CE008 – CE008_190	30	3	Coastal Flood Plain Grazing Marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00
CE009	30	3	Broadleaved, Mixed and Yew Woodland	10	Min CL Min N: 0.357 Min CL Max N:2.689 Min CL Max S:2.332
CE011	30	3	Broadleaved, Mixed and Yew Woodland	10	Min CL Min N: 0.357 Min CL Max N: 2.452 Min CL Max S: 2.094
CE013	30	3	Neutral Grassland	10	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S: 4
CE014	30	3	Neutral Grassland	10	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S: 4

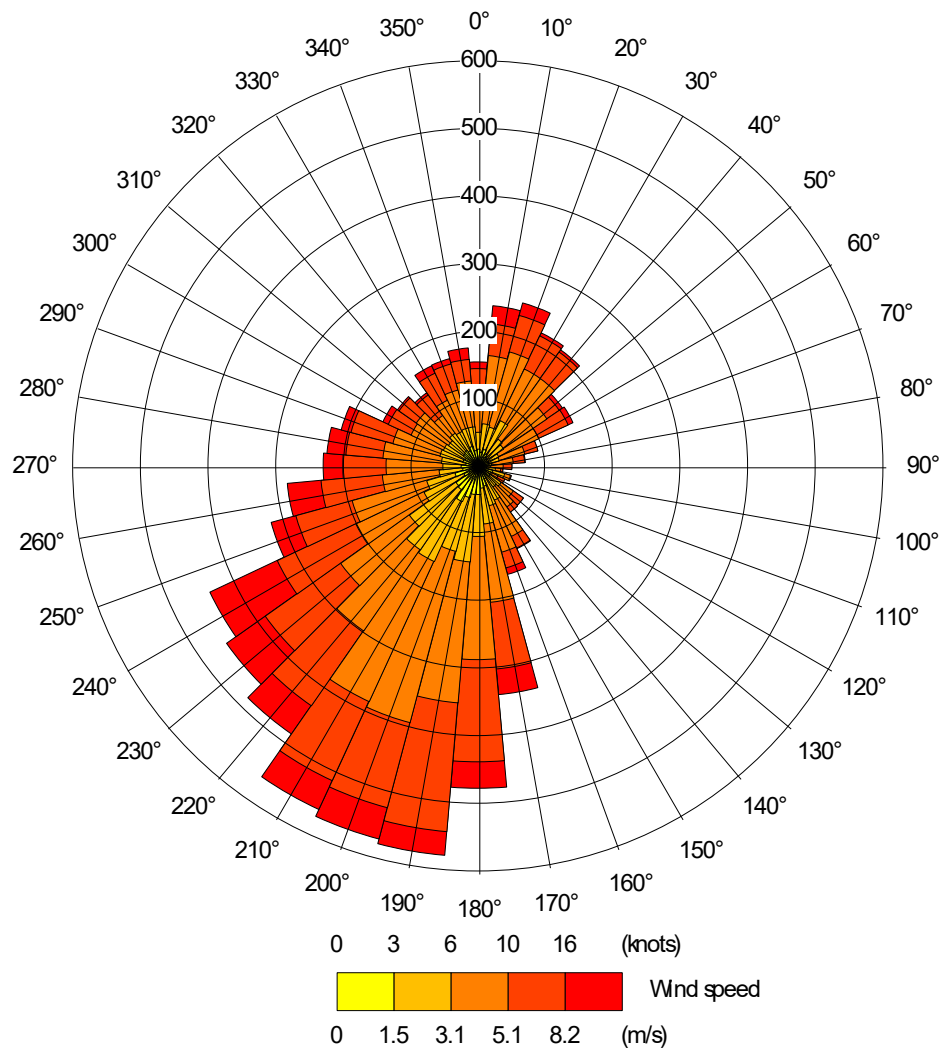
Table 3.14 APIS background data

Ecological receptor ID	NO _x (µg/m ³)	NH ₃ (µg/m ³)	N deposition (kg N/Ha/Yr)	Total acid deposition (Keq N/Ha/Yr)
CE001 – CE001_200	19.3	1.4	14.0	1.2
CE002 – CE002_200	19.3	1.4	14.0	1.2
CE003 – CE003_140	17.1	1.5	14.0	1.2
CE003_150 CE003_170	16.9	1.5	13.7	1.2
CE004 – CE004_180	18.4	1.6	14.1	1.2
CE004_190	22.7	1.6	14.1	1.2
CE005 – CE005_10	22.7	1.6	14.6	1.3
CE005 – CE005_150	19.7	1.6	14.6	1.2
CE005_160	19.8	1.6	14.3	1.2
CE006 – CE006_170	19.8	1.8	15.0	1.3
CE006_180	18.5	1.8	15.0	1.3
CE007	18.5	1.4	14.4	1.2
CE007 – CE007_140	15.0	1.4	14.4	1.2
CE007_150	19.3	1.3	14.2	1.2
CE008 – CE008_190	19.3	1.4	14.0	1.2
CE009	14.6	1.5	27.0	2.2
CE010	20.5	1.7	15.0	1.3
CE011	14.6	1.7	28.7	2.3
CE012	14.6	1.7	15.5	1.3
CE013	14.6	1.8	15.5	1.3
CE014	20.5	1.7	15.0	1.3

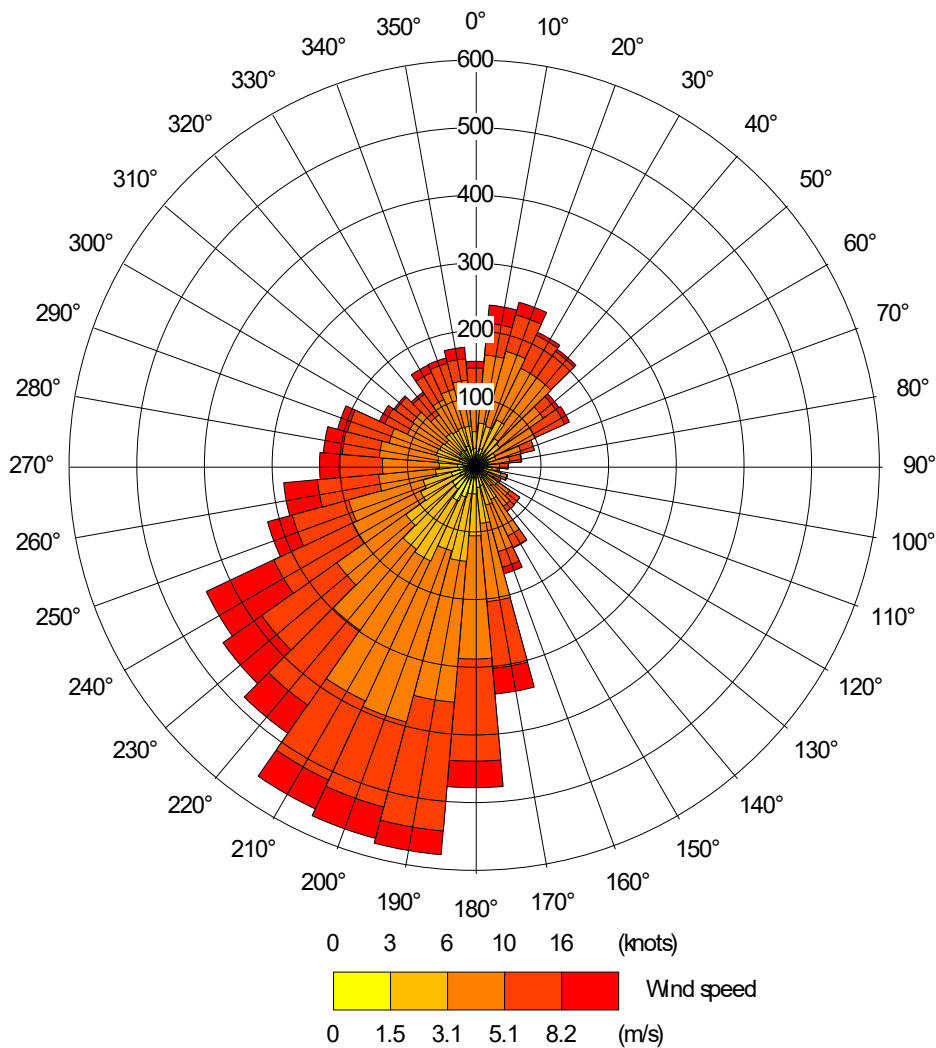
Meteorological data

- 3.4.29 The meteorological data used in this assessment were measured at Durham Tees Valley Airport meteorological station. The data was collected over the period 1st January 2024 to 31st December 2024 (inclusive) to match the baseline year of the construction traffic assessment. This site was chosen for this assessment as it is the nearest meteorological station to the Proposed Development. This meteorological site is located approximately 16km south west of the Proposed Development and was chosen due to its proximity to the Proposed Development.
- 3.4.30 Most dispersion models of roads do not use meteorological data if modelling calm wind conditions, as dispersion of air pollutants is more difficult to calculate in these circumstances. ADMS-Roads treats calm wind conditions by setting the minimum wind speed to 0.75m/s. Defra's LAQM.TG22 guidance [Ref 4] recommends that the meteorological data file is tested in a dispersion model and the relevant output log file checked to confirm the number of missing hours and calm hours that cannot be used by the dispersion model. This is important when considering predictions of high percentiles and the number of exceedances. The guidance recommends that meteorological data should only be used if the percentage of usable hours is greater than 85%.
- 3.4.31 Hourly sequential observation data was used in this assessment. The dataset includes 8,463 lines of usable hourly data, out of a total of 8,760 lines of data. This corresponds to 97% of the year, which is above the 85% threshold and meets the requirements of the Defra guidance making it adequate for the dispersion modelling.

3.4.32 A wind rose for this site is presented in



3.4.33 Inset 3.1. The wind rose indicates that the predominant wind direction at the Proposed Development is south westerly, with a significant south proportion.



Inset 3.1: Durham Tees Valley Airport – 2024 windrose

Consideration of terrain

- 3.4.34 Emissions from road traffic make the greatest contribution to pollutant concentrations at sensitive receptors adjacent to the source. For this reason, there is not normally a large variation in height between the emission source and residential properties next to the roads included in the model. Therefore, terrain is not included in the road traffic modelling assessment.

NO_x to NO₂ Conversion

- 3.4.35 To accompany the publication of the guidance document LAQM.TG(22) [Ref 4], a NO_x to NO₂ converter was made available as a tool to calculate the road NO₂ contribution from modelled road NO_x contributions. The tool comes in the form of an MS Excel spreadsheet and uses local authority specific data to calculate annual mean concentrations of NO₂ from dispersion model output values of annual mean concentrations of NO_x.

Version 9.1 (August 2024) of this tool has been used to calculate the total NO₂ concentrations at receptors from the modelled road NO_x contribution and associated background concentration. Due to the location of the Proposed Development, Stockton-on-Tees Borough Council (STBC) has been specified as the local authority for receptors (depending on specific receptor location), and the 'All other non-urban UK traffic' mix selected.

Model verification

- 3.4.36 Model verification refers to the comparison of modelled and measured pollutant concentrations at the same locations to determine the performance of the model. Should the majority of model results for NO₂ be within $\pm 25\%$ of the measured values and there is no systematic over or under-prediction of concentration, then the LAQM.TG(22) guidance [Ref 4] advises there is no adjustment necessary. If this is not the case, modelled concentrations are adjusted based on the observed relationship between modelled and measured NO₂ concentrations to provide a better agreement.
- 3.4.37 Modelled results may not compare as well at some locations for various reasons, including:
- errors/uncertainties in model input data (e.g., traffic flows and speed data estimates);
 - model set-up (including street canyons where applicable, road widths, location of monitoring sites);
 - neglect of local effects (including queues, bus stops and street canyons);
 - model limitations (treatment of surface roughness and meteorological data);
 - uncertainty in monitoring data, notably diffusion tubes (e.g. bias adjustment factors and annualisation of short-term data); and
 - uncertainty in emissions and emission factors.
- 3.4.38 The above factors were investigated as part of the model verification process to reduce the uncertainties as far as practicable.
- 3.4.39 Some monitoring locations are not suitable for model verification purposes as there may be specific local influences. In these circumstances, LAQM TG.22 [Ref 4] advises they should not be used. Therefore, each site was examined, and it was considered whether it was suitable for use in the verification study.

Model verification results

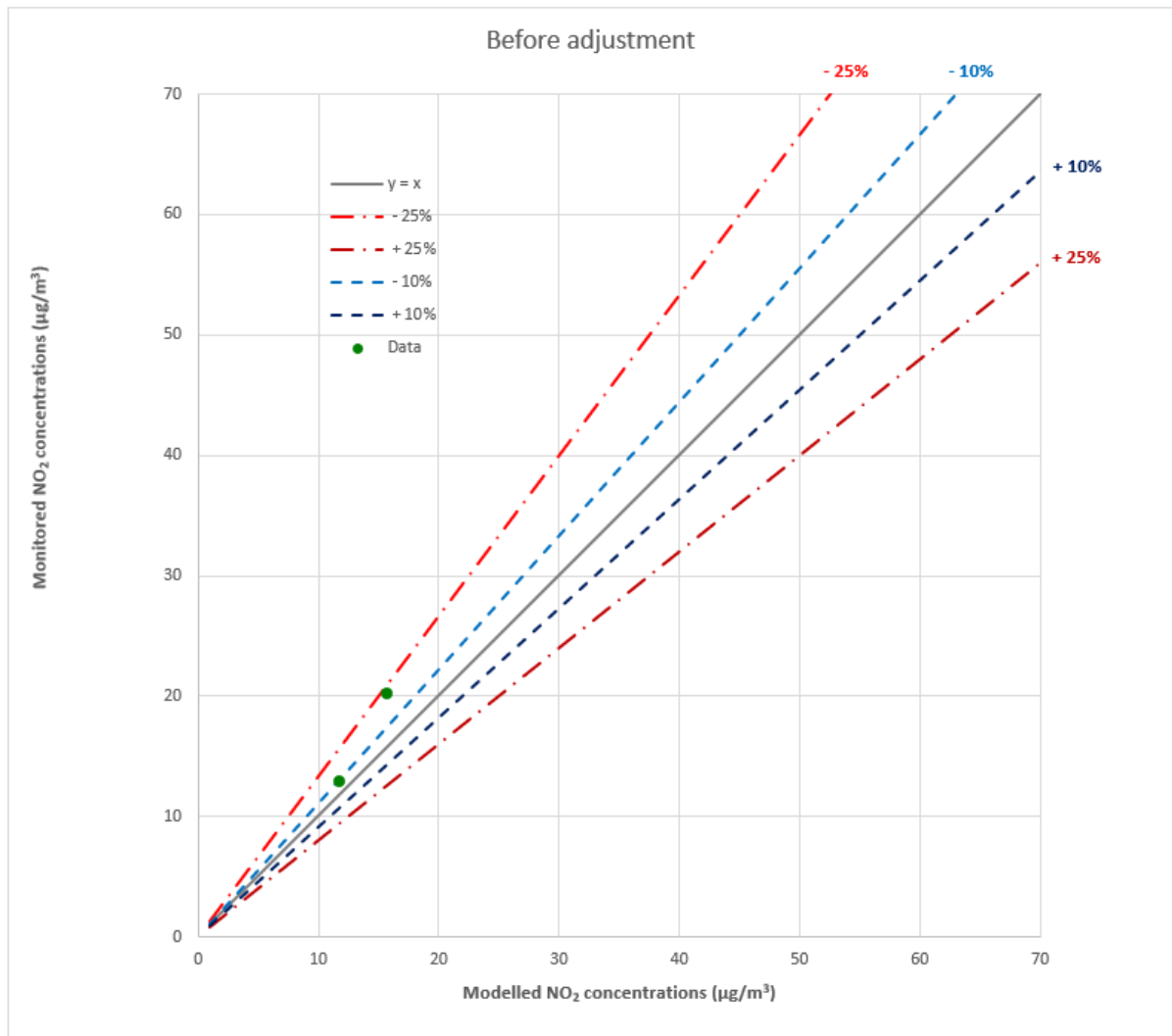
- 3.4.40 Model verification is based on the 2023 baseline model and undertaken using NO₂ diffusion tube sites; S09 (Marsh House Avenue, Billingham) and S14 (Portrack Lane, Stockton) [Ref 14]. Both sites are roadside diffusion tubes and the roads they are located along have been incorporated into the ARN using traffic data that was available from the traffic consultants on the project.
- 3.4.41 The location of these sites is shown on **Figure 8.1: Air Quality – Locations of Air Quality Monitoring Sites (ES Volume II, Application Document Ref. 6.2)**. No other sites were considered for use in verification purposes as they were either not roadside monitoring locations or were situated too far away from the modelled road networks to be considered representative.
- 3.4.42 Air quality monitoring data for 2024 was obtained from the 2025 STBC Annual Status Report² and compared with modelled concentrations at the same locations. Model verification was undertaken following the methodology described in LAQM.TG(22) [Ref 4].
- 3.4.43 A comparison of monitored and modelled annual mean NO₂ concentrations for 2024 before and after adjustment are presented in Table 3.15
- 3.4.44 The verification process showed that the model was underpredicting at the verification sites by 9% and 23% at the two monitoring sites used for verification. A road-NO_x adjustment factor of 2.6 has been calculated and applied. A graphical representation before and after adjustment are shown in Inset 3.2 and Inset 3.3.
- 3.4.45 After applying the road-NO_x adjustment factor of 2.6, the difference between modelled and monitored NO₂ concentrations was reduced to within +4% and -1% for the two sites, indicating a high level of model performance following adjustment.

² Stockton-on-Tees Borough Council (2024) 2024 Air Quality Annual Status Report.

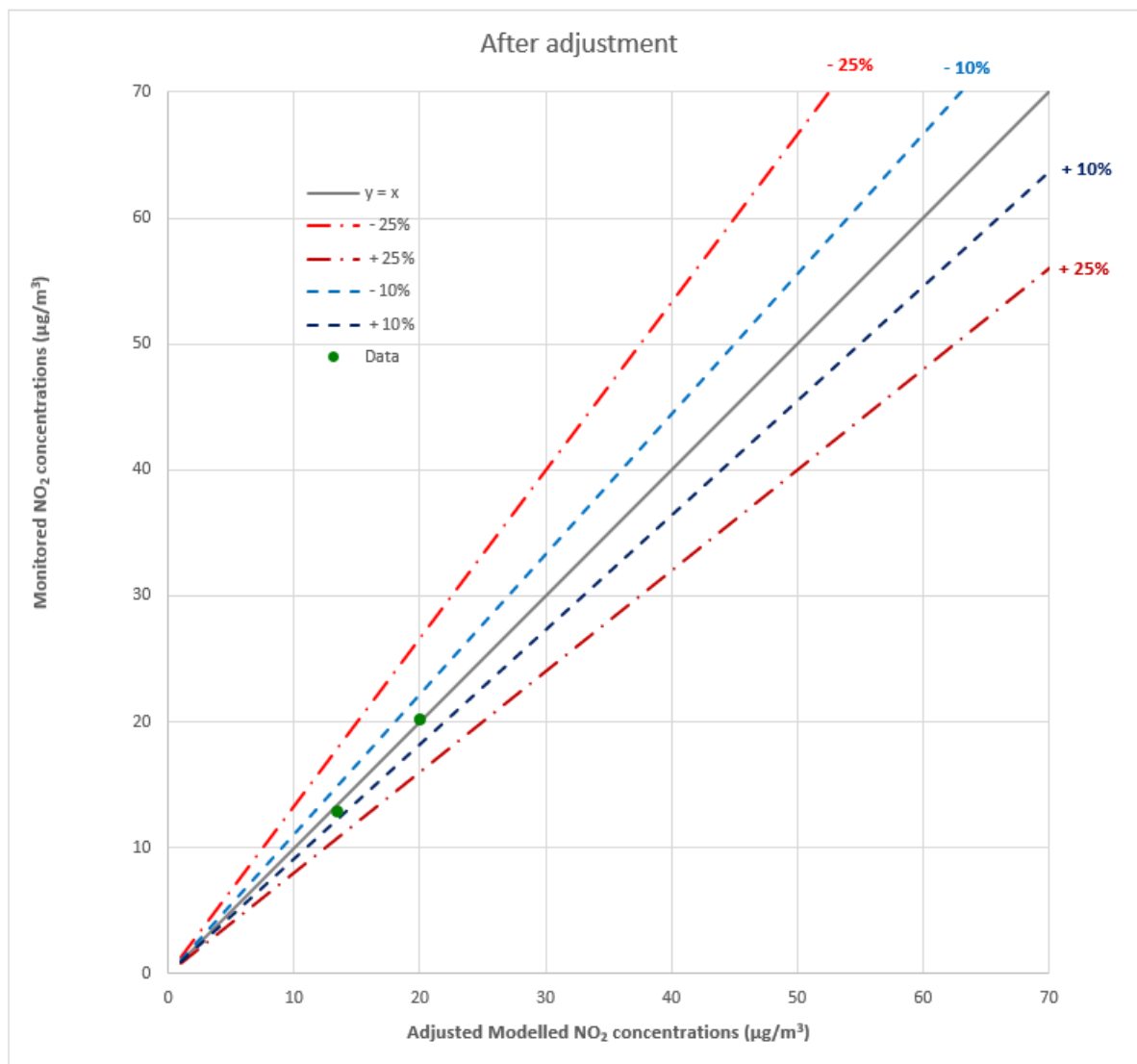
3.4.46

Table 3.15 Comparison of modelled and monitored annual mean NO₂ for 2023 before and after adjustment

Diffusion tube ID	Background concentration (µg/m ³)	Monitored concentration (µg/m ³)	Modelled concentration (µg/m ³)	% Difference (modelled-monitored/monitored)
Before adjustment				
S09	10.6	12.9	11.7	-9%
S14	12.7	20.2	15.6	-23%
After adjustment				
S09	10.6	12.9	13.5	4%
S14	12.7	20.2	20.0	-1%



Inset 3.2 **Modelled and monitored annual mean NO₂ concentrations before adjustment**



Inset 3.3 Modelled and monitored annual mean NO₂ concentrations after adjustment

3.5 Construction shipping assessment

3.5.1 As defined in **Chapter 20: Marine Navigation (ES Volume I, Application Document Ref. 6.1)** and the Navigation Risk Assessment (NRA) (**Appendix 20A: NRA (ES Volume III, Application Document Ref. 6.3)**), the construction phase of the Proposed Development covers two main phases of marine operations:

- Phase 1: Construction of the quay (and demolition of existing infrastructure) and dredging of the berth pocket and access channel; and
- Phase 2: Marine operations during the construction of the Lighthouse Green Fuels (LGF) plant (import of construction materials and modules).

- 3.5.2 As part of the assessment, it has been assumed that Phase 1 and Phase 2 will occur independently. Therefore, the impacts of each Marine Phase has been assessed separately.
- 3.5.3 TG(22) [Ref 4] provides guidance on assessing shipping emissions, stating that an assessment may be required where the following occurs:
- More than 5,000 large ship movements per year, with relevant exposure within 250m of the berth and main areas of manoeuvring; or
 - More than 15,000 large ship movements per year, with relevant exposure within 1km of these areas.
- 3.5.4 Large ships are defined as cross-channel ferries, roll on-roll off ships, bulk cargo, container ships, cruise liners, etc – one ship generating two movements (arrival and departure) [Ref 4].
- 3.5.5 Should one of the above criteria be met, the relevant authority where there is a risk of short-term objectives for NO₂, PM₁₀ and SO₂ and carry out a monitoring survey (6-month period minimum) should be carried out at relevant receptor locations. This can also be supported by dispersion modelling of shipping emission. Although, modelling of shipping emissions are likely to be subjected to high uncertainties [Ref 4].
- 3.5.6 For both Phase 1 and Phase 2, the overall shipping movements were below 5,000 movements, with 1,993 movements occurring in Phase 1 and 2,000 movements occurring in Phase 2, No sensitive human receptors were identified within 250m or 1km of the study area either. On this basis, it was determined that an assessment of shipping emissions on sensitive human receptors can be screened out from requiring assessment.
- 3.5.7 Natural England advises a precautionary approach to be taken on shipping emissions in relation to sensitive ecological receptors. They state that consideration should be given to whether large ships will emit constantly whilst docked, the type of fuels used and what impact it would have on the total amount of emissions.
- 3.5.8 In response to the precautionary approach advised by Natural England and due to the fact that there are sensitive ecological receptors within 1km of the shipping route, an assessment of construction phase shipping emissions has been undertaken to determine potential impacts on the sensitive ecological receptors.
- 3.5.9 For the determination of the potential impacts from construction shipping emissions, both Phase 1 and Phase 2 have been assessed separately. It is assumed that these phases occur independently, with Phase 1 happening first followed by Phase 2. It is assumed that Marine Phase 1 represents the

worst-case construction scenario as it involves the most transits and hours with ships idling at berth. However, the ships involved in the two phases are very different, with Marine Phase 1 mainly relying on smaller service vessels and Marine Phase 2 utilising larger vessels such as an MC-Class vessel and a 10,000 Deadweight tonnage (DWT) Coaster.

- 3.5.9.1 To understand the potential impacts of shipping on nearby sensitive receptors an assessment was undertaken on the shipping emissions both when the vessels are idling at berth as well as when they are transiting through the River Tees.
- 3.5.10 The predicted air quality impacts of the Proposed Development are evaluated against relevant national, regional and local air quality planning policy.
- 3.5.11 Effects at ecological receptors have been assessed in accordance with the method set out in the Environment Agency air emissions risk assessment guidance [Ref 9]. which states that impacts can be regarded as insignificant at sites with statutory designations if:
- the long-term process contribution (PC) is less than 1% of the critical level, or if greater than 1% then the predicted environmental concentration (PEC) is less than 70% of the critical level; and
 - the short-term PC is less than 10% of the critical level.
- 3.5.12 The impact of road traffic emissions can be regarded as insignificant at sites of local importance if:
- the long-term PC is less than 100% of the critical level; and
 - the short-term PC is less than 100% of the critical level.

Sensitive receptors

- 3.5.13 A desk-top study was undertaken to identify existing sensitive receptors that may be impacted by shipping movements in the construction phase.
- 3.5.14 In line with the guidance in TG(22) [Ref 4], sensitive human receptors were reviewed within 250m and 1km of the study area. This included both the shipping route and the quay area. It was determined that there were no sensitive human receptors within 250m or 1km of the study area either. On this basis, it was determined that an assessment of shipping emissions on sensitive human receptors can be screened out from this assessment.
- 3.5.15 For sensitive ecological receptors, the same screening area outlined in TG(22) [Ref 4] was utilised with sensitive ecological receptors identified within 1km of either the shipping route or the quay area. In total there were

seven ecological sites identified, all of which were part of the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI site.

- 3.5.16 The ecological receptors for which the impact of construction shipping emissions will be predicted are listed in Table 3.16. Modelled receptors are presented in **Figure 8.5 (ES Volume II, Application Document Ref. 6.2)**.

Table 3.16 Modelled receptors for the construction shipping assessment

Receptor ID	X	Y	Description	Shortest distance to source (m)
SE001	454272	526950	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI & Saltholme LWS	Quay: 3.1km Shipping Route: 341m
SE002	455556	527008	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	Quay: 3.5km Shipping Route: 825m
SE003	453959	526193		Quay: 2.3km Shipping Route: 502m
SE004	454278	528315		Quay: 4.5km Shipping Route: 767m
SE005	455624	527450		Quay: 4.5km Shipping Route: 695m
SE006	453586	525412		Quay: 1.6km Shipping Route: 1.0km
SE007	454702	526166		Quay: 2.4km Shipping Route: 230m

- 3.5.17 Background deposition information has been gathered for each of the selected sensitive ecological receptors from the APIS website [Ref 10] for NO_x, NH₃, nutrient nitrogen deposition and acid deposition. Information on the selected background concentrations are displayed below in Table 3.17.

Table 3.17 APIS critical levels and critical loads

Ecological receptor ID	Annual mean NO _x critical level (µg/m ³)	Annual mean SO ₂ critical level (µg/m ³)	Critical load class	N critical load (minimum)	Acid critical load (keq/ha/yr)
SE001	30	20	Coastal sand dune	5	Min CL Min N: 0.856 Min CL Max N:4.856
SE002	30	20	Coastal sand dune	5	Min CL Max S:4.00
SE003	30	20	Saltmarsh	10	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00
SE004	30	20	Coastal sand dune	5	Min CL Max S:4.00 Min CL Min N: 0.856
SE005	30	20	Coastal sand dune	5	Min CL Max N:4.856
SE006	30	20	Coastal sand dune	5	
SE007	30	20	Salt marsh	10	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00

Dispersion model set up

3.5.18 The general model conditions used in the assessment of shipping emissions are summarised in Table 3.18. Other more detailed data used to model the dispersion of emissions is considered below.

Table 3.18 General ADMS roads model conditions for the construction shipping assessment

Variable	Input
Surface roughness at source	0.3m
Minimum Monin-Obukhov length for stable conditions	30m
Receptors	Selected discrete receptors
Receptor location	X, Y co-ordinates determined by GIS. The height of ecological receptors will be modelled at 0m, representative of ground level
Modelled pollutants	NO _x , PM ₁₀ , PM _{2.5} , SO ₂
Emission factors	Fourth International Maritime Organisation (IMO) Green House Gas (GHG) Study [Ref 11]
Meteorological data	1 year of hourly sequential data, Durham Tees Valley Meteorological Station (2024)
Emission profiles	None used – emissions averaged across a 24-hour period
Terrain types	Flat terrain
Model output	Long-term annual mean NO _x concentration (µg/m ³) Long-term annual mean PM ₁₀ concentration (µg/m ³) Long-term annual mean PM _{2.5} concentration (µg/m ³) Long-term annual mean SO ₂ concentration (µg/m ³)

3.5.19 The model conditions for the construction shipping assessment are broadly the same as the construction traffic assessment. Information on meteorological conditions can be found above in Section 3.4.

Vessels

3.5.20 Information on the vessels involved in the construction phase was sourced from the **NRA (Appendix 20A: NRA (ES Volume III, Application Document Ref. 6.3))**. The breakdown of the vessels included in each Marine Phase is detailed below in Table 3.19 for Phase 1 and Table 3.20 for Phase 2.

Table 3.19 Marine Phase 1 - vessels

Vessel Type	No. of anticipated transits*	Period of navigation activity	IMO GHG vessel class
Demolition of existing infrastructure			
Jack-up barge with crawler crane	1	3 months	Service – other
Flat deck barge ^[1]	26	3 months	-
Multi-cat / Tug	26	3 months	Service - tug
General workboat / dive support / crew transfer boat	180	3 months	Service - tug
Dredging			
Backhoe dredger (BHD)	1	5 months	BHD ^[2]
Multi-cat / Tug	1	5 months	Service - tug
Self-propelled Hopper Barge	528	5 months	Service – other
General workboat / crew transfer boat	300	5 months	Service – tug
Construction of new quayside			
Jack up barge with crawler crane (x2)	2	12 months	Service – other
Spud barge with crawler crane	1	12 months	Service – other
Flat deck barge (x2) ^[1]	41	12 months	-
Multi-cat / Tug (x1)	41	12 months	Service – tug
General workboat / crew transfer boat (x1)	240	12 months	Service – tug
Multi-cat / Tug	1	5 months	Service - tug
Self Propelled Hopper Barge	304	5 months	Service – other
General workboat / crew transfer boat	300	5 months	Service - tug
Note: Anticipated transits (total) is defined as round trips including both arrival and departure. ^[1] The flat deck barge has no engine and therefore has not been assigned a vessel class from the IMO GHG study ^[2] There is not an equivalent vessel class in the IMO GHG study for the BHD. Therefore, an example BHD was used in the study.			

Table 3.20 Marine Phase 2 - vessels

Vessel Type	No. of anticipated transits*	Period of navigation activity	IMO GHG vessel class
MC-Class	Portion of 200 total transits (with 10% Med-Moored)	18 months	MC-Class ^[1]
CY-Class vessel	Portion of 200 total transits	18 months	– ^[2]
LO-LO vessel	Portion of 200 total transits	18 months	– ^[2]
North Sea Barge	Portion of 200 total transits	18 months	– ^[2]
10,000 Deadweight tonnage (DWT) coaster	40	9 months (only used for bulk aggregate deliveries).	Bulk Carrier
Tug	2 to 4 per vessel arrival	As above	Service - tug
Note: Anticipated transits (total) is defined as round trips including both arrival and departure. ^[1] The MC-Class is a specialised vessel and an equivalent class does not exist in the IMO GHG study. Therefore, an example MC-Class vessel was used in the study ^[2] It is assumed that all of the 200 movements will be the MC-Class to provide a worst-case assessment. Therefore, no vessel class has been assigned to the CY-Class, LO-LO or North Sea Barge.			

- 3.5.21 After discussion with the project marine specialist, it was determined that the flat deck barges could be excluded from the assessment as they do not have an engine and would be manoeuvred through the use of a Tug. It was also determined with project marine specialist that the general workboat / dive support / crew transfer boats could be excluded from the assessment as they would not be idling at berth at any point and they are only transiting short distances within the existing port area to transfer crew to the working area.
- 3.5.22 For Phase 2, a pre-cautionary worst-case approach was taken in line with the NRA (**Appendix 20A: NRA, ES Volume III, Application Document Ref. 6.3**) where all of the 200 movements are assumed to be MC-Class vessels. This is because these vessels are likely to be the largest vessel used and have largest engine capacity. The MC-Class vessels also rely on the use of four Tugs to manoeuvre through the river to the quay, which is more conservative than some of the smaller vessels which may only require two tugs per arrival.

- 3.5.23 The specific vessel type used in each phase was cross-referenced against the IMO GHG study [Ref 11] to determine the power output (kW) of the associated main engine, auxiliary engine and boiler engine both at berth and at sea in order to determine emissions both idling at the quay and navigating through the River Tees. The modelling categories used for at berth and manoeuvring emissions calculations are shown in Table 3.21.

Table 3.21 Construction phase vessel modelling categories

Vessel Type	Description	Units
Bulker carrier	10,000 – 34,999	DWT
MC-Class	20,675	DWT
BHD	0+	-
Service – Tug	0+	-
Service - Other	0+	-

- 3.5.24 Certain vessels are not captured in the IMO GHG study either due to their small size or being a very specific type of vessel. For the smaller vessels, they were classified as either 'service – tug' or 'service – other' and this was agreed with the project marine specialist. For the BHD and MC-Class specific example vessels were sourced for use in the assessment.

Vessels at berth

- 3.5.25 For vessels at berth, the emissions were calculated using the time each vessel would spend at berth, as defined by the NRA (**Appendix 20A: NRA, ES Volume III, Application Document Ref. 6.3**), the auxiliary engine power at berth, boiler power at berth, specific fuel oil consumption (SFOC) and pollutant emission factors, as defined by the IMO GHG study [Ref 11].
- 3.5.26 It is assumed that all vessels will turn off their main engines at berth and will only run on auxiliary engines and use boiler power (where one is installed).
- 3.5.27 The estimated heights were taken from the Southampton Clean Air Zone (CAZ) - Air Quality Modelling Methodology report [Ref 12], which provided estimates on vessel release heights as part of their as well as utilising information from an EU study into ship emissions. This data was used lieu of actual data on vessel emission release heights.
- 3.5.28 Details of the construction phase vessel at berth modelling are provided below in Table 3.22.

Table 3.22 Details of the construction phase vessels at berth modelling

Vessel	IMO GHG vessel class	Auxiliary engine load at berth (kW)	Boiler power at berth (kW)	Average time at berth (hrs)	Modelled berth height (m)
Phase 1 - Demolition of existing infrastructure					
Jack-up barge with crawler crane	Service - other	220	-	2,190	5
Multi-cat / Tug	Service – tug	100	-	2,190	5
Phase 1 – Dredging					
BHD	BHD	1280	-	3,650	5
Multi-cat / Tug	Service - tug	100	-	3,650	5
Self-propelled Hopper Barge	Service - other	220	-	3,650	5
Phase 1 - Construction of new quayside					
Jack up barge with crawler crane (x2)	Service - other	220	-	8760	5
Spud barge with crawler crane	Service – other	220	-	8,760	5
Multi-cat / Tug (x1)	Service – tug	100	-	8,760	5
Multi-cat / Tug	Service – tug	100	-	3,650	5
Self Propelled Hopper Barge	Service – other	220	-	3,650	5
Phase 2 – Construction of landside facilities					
MC-Class	MC-Class	795.2	-	4,800	30
10,000 DWT coaster	Bulker Carrier	110	70	960	30
Tug	Service - tug	100	-	240	5

3.5.29 Emissions for each vessel at berth were calculated using Equation 1, which takes into account the auxiliary engine load, time spent at berth, SFOC and emissions factor for the relevant pollutant.

3.5.30 The emission factors used in the assessment assume a worst-case scenario, with the use of heavy fuel oil (HFO) with 2.6% sulphur content, [Ref 11. However, the Port is located within the North Sea ECA, so it can be assumed that in reality, vessels would likely be using fuel with a lower sulphur content. Previously, the IMO stipulated that a fuel correction factor

should be used to account for this. However, this has been removed in the fourth IMO GHG study [Ref 11] and has therefore not been undertaken. Details of the emissions factors for the auxiliary engine and boiler are provided below in Table 3.23.

Equation 1:

$$\begin{aligned} \text{Emissions per vessel at berth (g)} \\ = (AL \times T \times SFOC \times EF) + (BP \times T \times SFOC \times EF) \end{aligned}$$

AL = Auxillary engine load at berth for modelling category (kW)

BP = Boiler power at berth for modelling category (kW)

T = Time spent at berth (hrs)

SFOC = Specific fuel oil consumption (g fuel / kWh)

EF = Emissions factor (g pollutant/g fuel)

Table 3.23 Emissions factors for auxiliary engine and boiler at berth

Vessel	Auxiliary engine at berth			Boiler at berth		
	NO _x	PM	SO _x	NO _x	PM	SO _x
Emission factor (g pollutant/kWh)	11.2	0.9	12.0	2.1	0.6	12.0
SFOC (g fuel/kWh)	195	195	195	340	340	340
Emission factor (g pollutant/g fuel)	0.06	0.005	0.05	0.01	0.002	0.05

- 3.5.31 The fourth IMO GHG study [Ref 11] states that PM_{2.5} emissions should be assumed to be 92% of PM₁₀ emissions. Therefore, this assumption has been applied to this study, with a total PM emission being calculated and a 0.92 factor being applied to it to determine the PM_{2.5} emission.
- 3.5.32 To model the emissions at berth, the emissions from the auxiliary engine and boiler were combined to give a total emission at berth from the vessels.
- 3.5.33 To determine the impact on nearby sensitive ecological receptors, the berth was modelled as an area source using the latest version of dispersion modelling software 'ADMS-Roads' (v5.1.0.2) [Ref 5]. The exact size and dimensions of the quay or the area where the vessels would be at berth are unknown at this current time. It was determined that the largest dimensions of the vessels listed in the **NRA (Appendix 20A: NRA, ES Volume III, Application Document Ref. 6.3)** would be used to determine the size of the area source.

- 3.5.34 The area sources were modelled with the heights shown in Table 3.22, with the estimated heights taken from Southampton Clean Air Zone - Air Quality Modelling Methodology report [Ref 12]. The area sources were modelled with a velocity of 15m/s and at ambient temperature (as determined by the meteorological data used). This provides a conservative approach to the dispersion modelling as it assumes there is no thermal buoyancy associated with the exhaust and therefore is likely to overestimate impacts in the near-field. In reality, the exhaust temperature will be higher than the ambient and will therefore disperse further before reaching ground level, which could have the potential for impacting receptors further away.

Vessels manoeuvring

- 3.5.35 For vessels manoeuvring, the emissions were calculated based on the time spent manoeuvring, main engine, auxiliary engine and boiler power whilst manoeuvring, specific fuel consumption (for an engine with a given fuel type) and pollutant emission factors. As with the vessels at berth assessment, information was sourced from the fourth IMO GHG study [Ref 11].
- 3.5.36 The time spent manoeuvring was determined based on the anticipated number of transits as defined by the **NRA (Appendix 20A: NRA, ES Volume III, Application Document Ref. 6.3)**, the total length of the defined shipping route and the speed travelled during the transit.
- 3.5.37 To allow for this calculation, the shipping route was divided into two segments, one covering the entrance into the River Tees (Segment A) and the second covering the entrance into the quay (Segment B). It was determined with the project marine specialist that for Segment A, a speed of 8 knots (14.8kph) would be used, which is defined as the speed limit for vessels passing the North Tees "A" Jetty [Ref 13]. For Segment B, the speed was reduced to account for vessels slowing as they come into berth and has been assumed to be 6 knots (9.3kph) after discussion with the project marine specialist.
- 3.5.38 Details of the construction phase vessel manoeuvring modelling are provided below in Table 3.24.

Table 3.24 Details of the construction phase vessels manoeuvring modelling

Vessel	IMO GHG vessel class	Main engine load (kW)	Auxiliary engine load (kW)	Boiler power (kW)	Time moving – segment A (hrs)	Time moving – segment B (hrs)	Modelled height (m)
Phase 1 - Demolition of existing infrastructure							
Jack-up barge	Service - other	1,620	220	-	0.52	0.55	5

Vessel	IMO GHG vessel class	Main engine load (kW)	Auxiliary engine load (kW)	Boiler power (kW)	Time moving – segment A (hrs)	Time moving – segment B (hrs)	Modelled height (m)
with crawler crane							
Multi-cat / Tug	Service – tug	1,086	80	-	13.6	14.2	5
Phase 1 – Dredging							
BHD	BHD	1,600	-	-	0.52	0.55	5
Multi-cat / Tug	Service - tug	1,086	80	-	0.52	0.55	5
Self-propelled Hopper Barge	Service - other	1,620	220	-	276	288	5
Phase 1 - Construction of new quayside							
Jack up barge with crawler crane (x2)	Service - other	1,620	220	-	1.0	1.1	5
Spud barge with crawler crane	Service – other	1,620	22-	-	0.52	0.55	5
Multi-cat / Tug (x1)	Service – tug	1,086	80	-	21.4	22.35	5
Multi-cat / Tug	Service – tug	1,086	80	-	0.52	0.55	5
Self Propelled Hopper Barge	Service – other	1,620	220	-	159	166	5
Phase 2 – Construction of landside facilities							
MC-Class	MC-Class	10,752	795.2	-	104	109	30
10,000 DWT coaster	Bulker Carrier	5,941	190	-	20.9	21.8	30
Tug	Service - tug	1,086	80	-	919	960	5

- 3.5.39 Emissions for vessels manoeuvring were calculated using Equation 2, which takes into account the main engine and auxiliary engine loads, boiler power, time spent at berth, SFOC and emissions factor for the relevant pollutant.
- 3.5.40 As with the at berth assessment, the emission factors used in the assessment assume a worst-case scenario, with the use of HFO with 2.6% sulphur content, [Ref 11]. However, the Port is located within the North Sea Emissions Control Area (ECA), so it can be assumed that in reality, vessels would likely be using fuel with a lower sulphur content. Previously, the IMO stipulated that a fuel correction factor should be used to account for this. However, this has been removed in the fourth IMO GHG study [Ref 11] and has therefore not been undertaken.
- 3.5.41 Details of the emissions factors for the main engine, auxiliary engine and boiler are provided below in Table 3.25.

Equation 2:

$$\begin{aligned} \text{Emissions per vessel movement (g)} \\ = (ML \times T \times SFOC \times EF) + (AL \times T \times SFOC \times EF) \\ + (BP \times T \times SFOC \times EF) \end{aligned}$$

ML = Main engine load at sea for modelling category (kW)

AL = Auxillary engine load at sea for modelling category (kW)

BP = Boiler power at sea for modelling category (kW)

T = Time spent manoeuvring (hrs)

SFOC = Specific fuel oil consumption (g fuel / kWh)

EF = Emissions factor (g pollutant/g fuel)

- 3.5.42 To model the impacts on sensitive receptors, emissions were calculated separately for Segment A and Segment B of the shipping route. Each of the segments was then modelled separately as a 'road source' using the latest version of dispersion modelling software 'ADMS-Roads' (v5.1.0.2) [Ref 5]. The line sources were modelled using the heights outlined in Table 3.24, based on the Southampton Clean Air Zone - Air Quality Modelling Methodology report [Ref 12]. The width of the source was assumed to be the width of the largest vessel, which is considered to be a conservative approach, as in reality the width of the exhaust will vary between vessels.
- 3.5.43 The vessels manoeuvring were modelled with a vertical exit velocity for the exhaust at 15m/s and at ambient temperature (as determined by the meteorological data used). This provides a conservative approach to the dispersion modelling as it assumes there is no thermal buoyancy

associated with the exhaust. In reality, the exhaust temperature will be higher than the ambient and will therefore disperse further before reaching ground level.

Table 3.25 Emissions factors for main engine, auxiliary engine and boiler whilst moving

Vessel	Main engine moving			Auxiliary engine moving			Boiler moving		
	NO _x	PM	SO _x	NO _x	PM	SO _x	NO _x	PM	SO _x
Emission factor (g pollutant/kWh)	14.4	0.95	10.3	11.2	0.9	12.0	2.1	0.6	12.0
SFOC (g fuel/kWh)	195	195	195	195	195	195	340	340	340
Emission factor (g pollutant/g fuel)	0.07	0.005	0.05	0.06	0.005	0.05	0.01	0.002	0.05

3.5.44 The fourth IMO GHG study [Ref 11] states that PM_{2.5} emissions should be assumed to be 92% of PM₁₀ emissions. Therefore, this assumption has been applied to this study, as previously discussed for the vessels at berth.

4 Construction traffic modelling results

4.1 Human health

Results of NO₂ modelling

- 4.1.1 The predicted annual mean NO₂ concentrations for the DM and DS scenarios at each receptor are presented in Table 4.1. As the change in NO₂ concentrations between the DS and DM scenarios are less than 1% (equating to 0.04µg/m³) of the NO₂ objective (40µg/m³), the effect of the Proposed Development on human receptors is considered to be **negligible** for annual mean NO₂ and therefore **not significant**.

Table 4.1 Results of NO₂ modelling for construction traffic

Receptor ID	DM 2030 (µg/m ³)	DS 2030 (µg/m ³)	Change (µg/m ³)	Impact descriptor
CT001	11.4	11.4	< 0.1	Negligible
CT002	9.3	9.3	0.1	Negligible
CT003	8.8	8.9	< 0.1	Negligible
CT004	9.2	9.3	0.1	Negligible
CT005	8.4	8.7	0.2	Negligible
CT006	8.9	9.1	0.2	Negligible
CT007	9.0	9.1	0.1	Negligible
CT008	8.7	8.7	< 0.1	Negligible
CT009	7.2	7.3	0.1	Negligible
CT010	11.3	11.7	0.3	Negligible
CT011	13.9	14.2	0.3	Negligible
CT012	14.6	15.0	0.4	Negligible
CT013	12.6	12.9	0.3	Negligible
CT014	19.3	19.9	0.6	Negligible
CT015	13.4	13.6	0.2	Negligible
CT016	8.3	8.3	< 0.1	Negligible
CT017	9.5	9.6	0.1	Negligible
CT018	9.8	10.0	0.1	Negligible
CT019	8.4	8.4	< 0.1	Negligible
CT020	13.8	13.8	< 0.1	Negligible
CT021	13.0	13.0	< 0.1	Negligible
CT022	9.5	9.5	< 0.1	Negligible
Results are presented to one decimal place.				

Results of PM₁₀ modelling

- 4.1.2 The predicted annual mean PM₁₀ concentrations for the DM and DS scenarios at each human receptor are presented in Table 4.2. As the change in PM₁₀ concentrations between the DS and DM scenarios are less than 1% (equating to 0.04µg/m³) of the PM₁₀ objective (40µg/m³), the effect of the Proposed Development on human receptors is considered to be **negligible** for annual mean PM₁₀ and therefore **not significant**.

Table 4.2 Results of PM₁₀ modelling for construction traffic

Receptor ID	DM 2030 (µg/m ³)	DS 2030 (µg/m ³)	Change (µg/m ³)	Impact descriptor
CT001	10.6	10.6	< 0.1	Negligible
CT002	10.5	10.5	< 0.1	Negligible
CT003	10.1	10.1	< 0.1	Negligible
CT004	10.1	10.1	< 0.1	Negligible
CT005	11.9	11.9	< 0.1	Negligible
CT006	12.0	12.0	< 0.1	Negligible
CT007	11.1	11.1	< 0.1	Negligible
CT008	10.0	10.0	< 0.1	Negligible
CT009	11.7	11.7	< 0.1	Negligible
CT010	9.7	9.8	0.1	Negligible
CT011	10.2	10.3	0.1	Negligible
CT012	10.4	10.5	0.1	Negligible
CT013	9.9	10.0	0.1	Negligible
CT014	11.0	11.1	0.1	Negligible
CT015	10.1	10.2	< 0.1	Negligible
CT016	10.9	10.9	< 0.1	Negligible
CT017	11.2	11.2	< 0.1	Negligible
CT018	11.2	11.2	< 0.1	Negligible
CT019	11.2	11.2	< 0.1	Negligible
CT020	11.5	11.5	< 0.1	Negligible
CT021	11.4	11.4	< 0.1	Negligible
CT022	10.9	10.9	< 0.1	Negligible

Results are presented to one decimal place.

Results of PM_{2.5} modelling

- 4.1.3 The predicted annual mean PM_{2.5} concentrations for the DM and DS scenarios at each human receptor are presented in Table 4.3. As the

change in PM_{2.5} concentrations between the DS and DM scenarios are less than 1% (equating to 0.01µg/m³) of the PM_{2.5} target (10µg/m³), the effect of the Proposed Development on human receptors is considered to be **negligible** for annual mean PM_{2.5} and therefore **not significant**.

Table 4.3 Results of PM_{2.5} Modelling for Construction Traffic

Receptor ID	DM 2030 (µg/m ³)	DS 2030 (µg/m ³)	Change (µg/m ³)	Impact descriptor
CT001	5.5	5.5	< 0.1	Negligible
CT002	5.3	5.3	< 0.1	Negligible
CT003	5.5	5.5	< 0.1	Negligible
CT004	5.6	5.6	< 0.1	Negligible
CT005	5.4	5.4	< 0.1	Negligible
CT006	5.5	5.5	< 0.1	Negligible
CT007	5.9	5.9	< 0.1	Negligible
CT008	5.5	5.5	< 0.1	Negligible
CT009	5.3	5.3	< 0.1	Negligible
CT010	5.4	5.5	< 0.1	Negligible
CT011	5.8	5.8	< 0.1	Negligible
CT012	5.8	5.9	0.1	Negligible
CT013	5.5	5.6	< 0.1	Negligible
CT014	6.1	6.1	0.1	Negligible
CT015	5.7	5.7	< 0.1	Negligible
CT016	5.8	5.8	< 0.1	Negligible
CT017	5.9	5.9	< 0.1	Negligible
CT018	5.9	5.9	< 0.1	Negligible
CT019	5.2	5.2	< 0.1	Negligible
CT020	6.2	6.2	< 0.1	Negligible
CT021	6.2	6.2	< 0.1	Negligible
CT022	6.3	6.3	< 0.1	Negligible

Results are presented to one decimal place.

4.2 Ecological receptors

4.2.1 NO_x, NH₃, nitrogen and acid deposition has been calculated for all receptors modelled in the assessment. The results are provided in Table 4.4 to Table 4.7.

- 4.2.2 Impacts at most ecological receptors can be considered to be insignificant as they are <1% of the relevant critical level or lower critical load, or well below the critical level with consideration of the background levels.

Results of NO_x modelling

- 4.2.3 The impacts of the construction traffic assessment for annual mean NO_x are shown below in Table 4.4. The critical level for NO_x is 30µg/m³ for each ecological receptor.

Table 4.4 Results of the construction traffic impact assessment on NO_x at ecological receptors

Ecological receptor ID	DS-DM NO _x (µg/m ³)	Max NO _x change (DS-DM) as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
CE001	0.8	2.6%	20.1	66.9%
CE001_10	0.5	1.8%	19.8	66.1%
CE001_20	0.4	1.3%	19.7	65.6%
CE001_30	0.3	1.1%	19.6	65.4%
CE001_40	0.3	0.9%	19.6	65.2%
CE001_50	0.2	0.8%	19.5	65.1%
CE001_60	0.2	0.7%	19.5	65.0%
CE001_70	0.2	0.6%	19.5	64.9%
CE001_80	0.2	0.6%	19.5	64.9%
CE001_90	0.2	0.5%	19.4	64.8%
CE001_100 – CE001_200	0.1	0.5%	19.4	64.8%
CE002	1.9	6.5%	21.2	70.8%
CE002_10	1.1	3.7%	20.4	68.0%
CE002_20	0.9	2.9%	20.2	67.2%
CE002_30	0.7	2.3%	20.0	66.6%
CE002_40	0.6	2.0%	19.9	66.3%
CE002_50	0.5	1.8%	19.8	66.1%
CE002_60	0.5	1.6%	19.8	65.9%
CE002_70	0.4	1.4%	19.7	65.8%
CE002_80	0.4	1.3%	19.7	65.6%
CE002_90	0.4	1.2%	19.7	65.5%
CE002_100	0.3	1.1%	19.6	65.4%
CE002_110	0.3	1.0%	19.6	65.3%
CE002_120	0.3	0.9%	19.6	65.3%

Ecological receptor ID	DS-DM NO _x (µg/m ³)	Max NO _x change (DS-DM) as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
CE002_130	0.3	0.9%	19.6	65.2%
CE002_140	0.3	0.8%	19.5	65.2%
CE002_150	0.2	0.8%	19.5	65.1%
CE002_160	0.2	0.8%	19.5	65.1%
CE002_170	0.2	0.7%	19.5	65.0%
CE002_180	0.2	0.7%	19.5	65.0%
CE002_190	0.2	0.6%	19.5	65.0%
CE002_200	0.2	0.6%	19.5	64.9%
CE003	0.7	2.2%	17.8	59.4%
CE003_10	0.5	1.6%	17.6	58.8%
CE003_20	0.4	1.3%	17.5	58.4%
CE003_30	0.3	1.1%	17.5	58.2%
CE003_40	0.3	0.9%	17.4	58.1%
CE003_50	0.2	0.8%	17.4	57.9%
CE003_60	0.2	0.7%	17.4	57.8%
CE003_70	0.2	0.6%	17.3	57.7%
CE003_80	0.2	0.6%	17.3	57.8%
CE003_90 – CE003_170	0.1	0.5%	17.3	57.6%
CE004	0.9	3.1%	19.3	64.2%
CE004_10	0.6	1.9%	18.9	63.0%
CE004_20	0.4	1.4%	18.8	62.5%
CE004_30	0.3	1.1%	18.7	62.2%
CE004_40	0.3	0.9%	18.6	62.1%
CE004_50	0.2	0.8%	18.6	61.9%
CE004_60	0.2	0.7%	18.5	61.8%
CE004_70	0.2	0.6%	18.5	61.8%
CE004_80	0.2	0.5%	18.5	61.7%
CE004_90 – CE004_190	0.1	0.5%	18.5	61.7%
CE005	0.4	1.2%	23.0	76.8%
CE005_10	0.3	0.9%	23.0	76.6%
CE005_20	0.2	0.8%	22.9	76.5%
CE005_30	0.2	0.7%	20.0	66.5%

Ecological receptor ID	DS-DM NO _x (µg/m ³)	Max NO _x change (DS-DM) as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
CE005_40	0.2	0.6%	19.9	66.4%
CE005_50	0.2	0.5%	19.9	66.4%
CE005_60 – CE005_160	0.1	0.5%	19.9	66.3%
CE007	0.3	0.9%	18.7	68.0%
CE007_10	0.2	0.7%	18.7	67.4%
CE007_20	0.2	0.6%	15.2	67.0%
CE007_30	0.2	0.5%	15.2	66.8%
CE007_40 – CE007_150	0.1	0.5%	15.1	66.7%
CE008	0.4	1.4%	19.7	66.3%
CE008_10	0.3	1.1%	19.6	66.3%
CE008_20	0.3	0.9%	19.6	66.3%
CE008_30	0.2	0.8%	19.5	62.4%
CE008_40	0.2	0.7%	19.5	62.3%
CE008_50	0.2	0.6%	19.5	50.6%
CE008_60	0.2	0.6%	19.5	50.5%
CE008_70	0.2	0.5%	19.4	50.5%
CE008_80 – CE008_190	0.1	0.5%	19.4	50.4%
CE009	0.3	1.0%	14.9	65.4%
CE011	0.3	0.9%	14.8	65.2%
CE013	0.0	0.0%	14.6	65.1%
CE014	0.5	1.7%	21.0	65.0%
All results are presented to one decimal place				

Results of NH₃ modelling

- 4.2.4 The impacts of the construction traffic assessment for annual mean NO_x are shown below in Table 4.5. The critical level for NH₃ is 3µg/m³ for each ecological receptor.

Table 4.5 Results of the construction traffic impact assessment for NH₃ at ecological receptors

Ecological receptor ID	DS-DM NH ₃ (µg/m ³)	Max NH ₃ change (DS-DM) as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
CE001	0.1	1.7%	1.4	47.9%
CE001_10	< 0.1	1.1%	1.4	47.3%
CE001_20 – CE001_200	< 0.1	0.9%	1.4	47.1%
CE002	0.2	5.5%	1.6	51.7%
CE002_10	0.1	3.1%	1.5	49.3%
CE002_20	0.1	2.4%	1.5	48.5%
CE002_30	0.1	2.0%	1.4	48.2%
CE002_40	0.1	1.7%	1.4	47.9%
CE002_50	< 0.1	1.5%	1.4	47.7%
CE002_60	< 0.1	1.3%	1.4	47.5%
CE002_70	< 0.1	1.2%	1.4	47.3%
CE002_80	< 0.1	1.1%	1.4	47.2%
CE002_90	< 0.1	1.0%	1.4	47.2%
CE002_100 – CE001_200	< 0.1	0.9%	1.4	47.1%
CE003	0.1	2.9%	1.6	53.2%
CE003_10	0.1	2.1%	1.6	52.3%
CE003_20	< 0.1	1.6%	1.6	51.9%
CE003_30	< 0.1	1.3%	1.5	51.5%
CE003_40	< 0.1	1.0%	1.5	51.3%
CE003_50	< 0.1	0.9%	1.5	51.1%
CE003_60	< 0.1	0.8%	1.5	51.0%
CE003_70	< 0.1	0.7%	1.5	50.9%
CE003_80	< 0.1	0.6%	1.5	50.9%
CE003_90 - CE003_170	< 0.1	0.5%	1.5	50.8%
CE004	0.1	2.6%	1.7	55.9%
CE004_10	< 0.1	1.6%	1.6	55.0%
CE004_20	< 0.1	1.2%	1.6	54.6%
CE004_30	< 0.1	1.0%	1.6	54.3%
CE004_40 – CE004_190	< 0.1	0.8%	1.6	54.2%

Ecological receptor ID	DS-DM NH ₃ (µg/m ³)	Max NH ₃ change (DS-DM) as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
CE005	< 0.1	1.2%	1.7	55.4%
CE005_10 – CE005_160	< 0.1	0.9%	1.7	55.2%
CE007 – CE007_150	< 0.1	0.6%	1.5	61.7%
CE008	< 0.1	1.2%	1.4	59.8%
CE008_10	< 0.1	0.9%	1.4	59.8%
CE008_20 – CE008_190	< 0.1	0.7%	1.4	59.8%
CE009	< 0.1	0.7%	1.6	47.1%
CE011	< 0.1	0.3%	1.8	46.9%
CE013	< 0.1	0.7%	1.8	46.8%
CE014	< 0.1	1.3%	1.9	46.7%
All results are provided to one decimal place.				

Nitrogen deposition results

- 4.2.5 The impacts of the operational traffic assessment for nitrogen deposition are shown below in Table 4.6. The minimum critical load for nitrogen deposition used in the assessment is 10kg N/ha/yr for each of the ecological receptors, which is the lower end of the critical load range for coastal floodplain and grazing marsh, considered to be the relevant habitat type present at receptors CE001 – CE008, which constitute the Teesmouth and Cleveland SPA, Ramsar and SSSI site. For CE009, which is the Cowpen Bewley LNR, the relevant critical load is based on broadleaved, mixed and yew woodland. The relevant habitat type for each of the receptor's locations was determined from data held on APIS [Ref 10] and Magic Maps [Ref 15].
- 4.2.6 For nitrogen deposition, the assessment has considered contributions from both NO_x and NH₃. The magnitude of change in nitrogen deposition was >1% of the minimum critical load at transect points closest to the ARN at receptors CE001, CE002, CE003, CE004, CE005 and CE008 within the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI site. For the majority of these receptor locations, this occurred within 60m of the road and only extended beyond this distance at CE002, where 1% was exceeded up to 110m from the ARN. At all receptors there is seen to be a significant drop off in nitrogen deposition in relation to distance from the ARN.

- 4.2.7 Due to the deposition being >1% and the PEC exceeding 70% of the critical load at these locations, nitrogen deposition could not be initially screened out of further assessment.
- 4.2.8 It should be noted that the construction traffic data provided is for 2030, which is the worst case year out of the whole four year construction programme and represents the overall peak activity of the construction period. The total number of construction workers onsite during 2030 is half of the entire construction workforce for the four year period. The year 2030 has around 2,000 workers onsite per day, in comparison to 2029, where there would be approximately half that, and in 2028 and 2031 there would be even fewer (around 500 per day).
- 4.2.9 Additionally, during 2030, there are two very intensive quarters and two that are less so. The construction traffic data used in this assessment is based on the worst-case month, assuming each month is equally as busy throughout 2030, whereas realistically the flows would be lower as an average across 2030 (around 1,800 per day).
- 4.2.10 As a result, the construction traffic data used in this assessment is highly conservative and likely to be well above the realistic construction traffic flows for this period. This indicates that the air quality results are also highly conservative and would likely be much lower in the other construction years of 2028, 2029 and 2031.
- 4.2.11 Additionally, in the DM scenario, exceedances >70% of the critical load were already observed at these receptor points (where nitrogen deposition changes were >1% of the critical load) due to existing high nitrogen deposition backgrounds, rather than the PC.
- 4.2.12 Following discussion with the project ecologist, these results can be considered to be not significant using professional judgement, given the highly conservative nature of the data used in the modelling, the short term and temporary nature of the construction activities and that nitrogen deposition effects are understood to only be significant in a period over five years [Ref 16].

Table 4.6 Results of the construction traffic impact assessment on nitrogen deposition at ecological receptors

Ecological Receptor ID	DS-DM PC nitrogen deposition (Kg N/ha/yr)	Max nitrogen deposition PC (DS-DM) as % of critical load	DS PEC (Kg N/ha/yr)	DS PEC as % of min critical load
CE001	0.3	3.2%	16.0	159.8%
CE001_10	0.2	2.1%	15.4	154.0%
CE001_20	0.2	1.7%	15.1	151.1%
CE001_30	0.1	1.4%	14.9	149.3%
CE001_40	0.1	1.1%	14.8	147.9%
CE001_50	0.1	1.0%	14.7	147.0%
CE001_60 – CE001_200	0.1	0.9%	14.6	146.3%
CE002	1.0	9.9%	19.0	189.7%
CE002_10	0.6	5.6%	16.7	167.5%
CE002_20	0.4	4.3%	16.1	160.6%
CE002_30	0.4	3.6%	15.7	157.0%
CE002_40	0.3	3.1%	15.5	154.5%
CE002_50	0.3	2.7%	15.3	152.7%
CE002_60	0.2	2.4%	15.1	151.3%
CE002_70	0.2	2.1%	15.0	150.2%
CE002_80	0.2	1.9%	14.9	149.3%
CE002_90	0.2	1.8%	14.8	148.5%
CE002_100	0.2	1.6%	14.8	147.8%
CE002_110	0.1	1.5%	14.7	147.2%
CE002_120	0.1	1.4%	14.7	146.8%
CE002_130	0.1	1.3%	14.6	146.3%
CE002_140	0.1	1.2%	14.6	146.0%
CE002_150	0.1	1.1%	14.6	145.6%
CE002_160	0.1	1.1%	14.5	145.3%
CE002_170	0.1	1.0%	14.5	145.1%
CE002_180	0.1	1.0%	14.5	144.8%
CE002_190 - CE002_200	0.1	0.9%	14.5	144.6%
CE003	0.5	5.0%	16.7	166.8%
CE003_10	0.4	3.6%	15.9	159.1%
CE003_20	0.3	2.8%	15.5	154.8%

Ecological Receptor ID	DS-DM PC nitrogen deposition (Kg N/ha/yr)	Max nitrogen deposition PC (DS-DM) as % of critical load	DS PEC (Kg N/ha/yr)	DS PEC as % of min critical load
CE003_30	0.2	2.2%	15.2	151.9%
CE003_40	0.2	1.8%	15.0	150.0%
CE003_50	0.2	1.5%	14.9	148.5%
CE003_60	0.1	1.3%	14.7	147.5%
CE003_70	0.1	1.2%	14.7	146.6%
CE003_80	0.1	1.0%	14.6	145.9%
CE003_90	0.1	1.0%	14.5	145.4%
CE003_100 – CE003_170	0.1	0.9%	14.5	144.9%
CE004	0.5	4.7%	16.7	166.7%
CE004_10	0.3	2.9%	15.7	157.3%
CE004_20	0.2	2.2%	15.3	153.1%
CE004_30	0.2	1.8%	15.1	150.8%
CE004_40	0.1	1.5%	14.9	149.3%
CE004_50	0.1	1.3%	14.8	148.3%
CE004_60	0.1	1.1%	14.8	147.5%
CE004_70	0.1	1.0%	14.7	146.9%
CE004_80 – CE004_190	0.1	0.9%	14.6	146.4%
CE005	0.2	2.1%	16.0	159.6%
CE005_10	0.2	1.7%	15.7	157.4%
CE005_20	0.1	1.4%	15.6	155.9%
CE005_30	0.1	1.2%	15.2	151.6%
CE005_40	0.1	1.1%	15.1	150.7%
CE005_50	0.1	1.0%	15.0	150.1%
CE005_60 – CE005_160	0.1	0.9%	15.0	149.6%
CE007	0.1	1.2%	15.3	152.5%
CE007_10	0.1	1.0%	15.1	151.2%
CE007_20 – CE007_150	0.1	0.8%	14.8	148.2%
CE008	0.2	2.1%	15.2	151.6%
CE008_10	0.2	1.6%	14.9	149.0%
CE008_20	0.1	1.3%	14.8	147.5%
CE008_30	0.1	1.2%	14.7	146.6%

Ecological Receptor ID	DS-DM PC nitrogen deposition (Kg N/ha/yr)	Max nitrogen deposition PC (DS-DM) as % of critical load	DS PEC (Kg N/ha/yr)	DS PEC as % of min critical load
CE008_40	0.1	1.0%	14.6	145.8%
CE008_50 – CE008_190	0.1	0.9%	14.5	145.3%
CE009	0.2	2.1%	28.5	285.2%
CE011	0.1	1.1%	45.8	458.2%
CE013	0.1	1.0%	29.6	295.9%
CE014	0.2	2.4%	31.1	310.5%
All results are provided to one decimal place.				

Acid deposition results

- 4.2.13 The effects from the operational traffic for acid deposition are shown below in Table 4.7. The minimum critical load for acid deposition used in the assessment is based on the relevant habitat type for each receptor, as determined by APIS [Ref 10] and Magic Maps [Ref 15]. For receptors CE001 – CE008 which constitute the Teesmouth and Cleveland SPA, Ramsar and SSSI site, this was based on the lower end of the Critical Load range for coastal floodplain and grazing marsh. For CE009, which is the Cowpen Bewley LNR, this is based on broadleaved, mixed and yew woodland.

Table 4.7 Results of the construction traffic impact assessment at ecological receptors on acid deposition

Ecological receptor ID	Critical load (keq/ha/yr)	DS-DM acid deposition (keq/ha/yr)	Max acid deposition (DS-DM) as % of critical load
CE001 - CE001_200	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	0.5%
CE002	Min CL Min N: 0.856	0.1	1.5%
CE002_10 - CE002_200	Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	0.8%
CE003 – CE003_170	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	0.1%
CE004 – CE004_190	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	0.7%
CE005 – CE005_160	Min CL Min N: 0.856	< 0.1	0.3%

Ecological receptor ID	Critical load (keq/ha/yr)	DS-DM acid deposition (keq/ha/yr)	Max acid deposition (DS-DM) as % of critical load
	Min CL Max N:4.856 Min CL Max S:4.00		
CE007 – CE007_150	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	0.2%
CE008 – CE008_190	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	0.3%
CE009	Min CL Min N: 0.357 Min CL Max N:2.689 Min CL Max S:2.332	< 0.1	0.6%
CE011	Min CL Min N: 0.357 Min CL Max N: 2.452 Min CL Max S: 2.094	< 0.1	0.3%
CE013	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S: 4.000	< 0.1	0.1%
CE014	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S: 4.000	< 0.1	0.3%
All results are provided to one decimal place.			

5 Construction shipping assessment

5.1 Marine Phase 1

5.1.1 NO_x, SO₂, nitrogen and acid deposition has been calculated for all receptors modelled in the assessment for Phase 1. The results are provided in Table 5.1 to Table 5.8.

5.1.2 Impacts at all ecological receptors can be considered to be insignificant as they are <1% of the relevant critical level or lower critical load, or well below the critical level with consideration of the background levels.

Results of NO_x modelling

5.1.3 The impacts of the construction shipping assessment for annual mean NO_x are shown below in Table 5.1 for emissions at berth and Table 5.2 for emissions whilst manoeuvring. The critical level for NO_x is 30µg/m³ for each ecological receptor.

Table 5.1 Results of the construction shipping impact assessment on NO_x at ecological receptors - at berth

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	0.01	0.02%	28.9	96.2%
SE002	0.01	0.03%	18.7	62.4%
SE003	0.01	0.02%	19.3	64.2%
SE004	0.01	0.02%	15.6	52.1%
SE005	0.01	0.03%	21.0	70.0%
SE006	0.01	0.02%	30.7	102.4%
SE007	0.01	0.03%	28.9	96.2%

Table 5.2 Results of the construction shipping impact assessment on NO_x at ecological receptors - manoeuvring

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	<0.01	<0.01%	28.9	96.2%
SE002	<0.01	<0.01%	18.7	62.4%
SE003	<0.01	<0.01%	19.3	64.2%
SE004	<0.01	<0.01%	15.6	52.0%
SE005	<0.01	<0.01%	21.0	70.0%
SE006	<0.01	<0.01%	30.7	102.4%
SE007	<0.01	0.01%	28.9	96.2%

Results of SO₂ modelling

- 5.1.4 The impacts of the construction shipping assessment for annual mean SO₂ are shown below in Table 5.3 for emissions at berth and Table 5.4 for emissions whilst manoeuvring. The critical level for SO₂ is 20µg/m³ for each ecological receptor.

Table 5.3 Results of the construction shipping impact assessment on SO₂ at ecological receptors – at berth

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	0.01	0.03%	2.9	14.6%
SE002	0.01	0.04%	2.1	10.7%
SE003	0.01	0.03%	2.5	12.7%
SE004	0.01	0.03%	2.2	10.8%
SE005	0.01	0.04%	2.1	10.5%
SE006	0.01	0.03%	3.6	18.2%
SE007	0.01	0.04%	2.9	14.6%

Table 5.4 Results of the construction shipping impact assessment on SO₂ at ecological receptors – manoeuvring

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	<0.01	<0.01%	2.9	14.6%
SE002	<0.01	<0.01%	2.1	10.7%
SE003	<0.01	<0.01%	2.5	12.6%
SE004	<0.01	<0.01%	2.1	10.7%
SE005	<0.01	<0.01%	2.1	10.5%
SE006	<0.01	<0.01%	3.6	18.2%
SE007	<0.01	0.01%	2.9	14.6%

Nitrogen deposition results

- 5.1.5 The impacts of the construction shipping assessment for nitrogen deposition are shown below in Table 5.5 for emissions at berth and Table 5.6 for emissions whilst manoeuvring. The minimum critical load for nitrogen deposition used in the assessment and the relevant habitat type for each of the receptor locations was determined from data held on APIS [Ref 10] and Magic Maps [Ref 15] and is shown above in Table 3.17.

Table 5.5 Results of the construction shipping impact assessment on nitrogen deposition at ecological receptors – at berth

Ecological Receptor ID	PC nitrogen deposition (Kg N/ha/yr)	PC as % of critical load	PEC (Kg N/ha/yr)	PEC as % of min critical load
SE001	<0.01	0.01%	13.5	270.2%
SE002	<0.01	0.02%	12.5	250.0%
SE003	<0.01	0.01%	13.5	135.0%
SE004	<0.01	0.01%	13.4	268.0%
SE005	<0.01	0.02%	12.5	250.0%
SE006	<0.01	0.01%	13.3	266.0%
SE007	<0.01	0.01%	12.9	129.0%

Table 5.6 Results of the construction shipping impact assessment on nitrogen deposition at ecological receptors – manoeuvring

Ecological Receptor ID	PC nitrogen deposition (Kg N/ha/yr)	PC as % of critical load	PEC (Kg N/ha/yr)	PEC as % of min critical load
SE001	<0.01	<0.01%	13.5	270.2%
SE002	<0.01	<0.01%	12.5	250.0%
SE003	<0.01	<0.01%	13.5	135.0%
SE004	<0.01	<0.01%	13.4	268.0%
SE005	<0.01	<0.01%	12.5	250.0%
SE006	<0.01	<0.01%	13.3	266.0%
SE007	<0.01	<0.01%	12.9	129.0%

Acid deposition results

5.1.6 The effects of the construction shipping assessment for acid deposition are shown below in Table 5.7 for emissions at berth and Table 5.8 for manoeuvring. The minimum critical load for acid deposition used in the assessment and the relevant habitat type for each of the receptor locations was determined from data held on APIS [Ref 10] and Magic Maps [Ref 15] and is shown above in Table 3.17.

Table 5.7 Results of the construction traffic impact assessment at ecological receptors on acid deposition

Ecological receptor ID	Critical load (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition as % of critical load
SE001	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE002	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE003	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE004	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE005	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE006	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE007	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%

Table 5.8 Results of the construction traffic impact assessment at ecological receptors on acid deposition

Ecological receptor ID	Critical load (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition as % of critical load
SE001	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE002	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE003	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE004	Min CL Min N: 0.856	< 0.1	<0.1%

Ecological receptor ID	Critical load (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition as % of critical load
	Min CL Max N:4.856 Min CL Max S:4.00		
SE005	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE006	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE007	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%

5.2 Marine Phase 2

5.2.1 NO_x, SO₂, nitrogen and acid deposition has been calculated for all receptors modelled in the assessment for Phase 2. The results are provided in Table 5.9 to Table 5.16.

5.2.2 Impacts at all ecological receptors can be considered to be insignificant as they are <1% of the relevant critical level or lower critical load, or well below the critical level with consideration of the background levels.

Results of NO_x modelling

5.2.3 The impacts of the construction shipping assessment for annual mean NO_x are shown below in Table 5.9 for emissions at berth and Table 5.10 for emissions whilst manoeuvring. The critical level for NO_x is 30µg/m³ for each ecological receptor.

Table 5.9 Results of the construction shipping impact assessment on NO_x at ecological receptors - at berth

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	<0.01	0.01%	28.9	96.2%
SE002	<0.01	0.01%	18.7	62.4%
SE003	<0.01	0.01%	19.3	64.2%
SE004	<0.01	0.01%	15.6	52.1%
SE005	<0.01	0.01%	21.0	70.0%
SE006	<0.01	<0.01%	30.7	102.4%
SE007	<0.01	0.01%	28.9	96.2%

Table 5.10 Results of the construction shipping impact assessment on NO_x at ecological receptors - manoeuvring

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	<0.01	<0.01%	28.9	96.2%
SE002	<0.01	<0.01%	18.7	62.4%
SE003	<0.01	<0.01%	19.3	64.2%
SE004	<0.01	<0.01%	15.6	52.0%
SE005	<0.01	<0.01%	21.0	70.0%
SE006	<0.01	<0.01%	30.7	102.4%
SE007	<0.01	<0.01%	28.9	96.2%

Results of SO₂ modelling

The impacts of the construction shipping assessment for annual mean SO₂ are shown below in Table 5.11 for emissions at berth and

5.2.4 Table 5.12 for emissions whilst manoeuvring. The critical level for SO₂ is 20µg/m³ for each ecological receptor.

Table 5.11 Results of the construction shipping impact assessment on SO₂ at ecological receptors – at berth

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	<0.01	0.01%	2.9	14.6%
SE002	<0.01	0.01%	2.1	10.7%
SE003	<0.01	0.01%	2.5	12.7%
SE004	<0.01	0.01%	2.2	10.8%
SE005	<0.01	0.01%	2.1	10.5%
SE006	<0.01	0.01%	3.6	18.2%
SE007	<0.01	0.01%	2.9	14.6%

Table 5.12 Results of the construction shipping impact assessment on SO₂ at ecological receptors – manoeuvring

Ecological receptor ID	PC (µg/m ³)	PC as % of critical level	PEC (µg/m ³)	PEC as % of the critical level
SE001	<0.01	<0.01%	2.9	14.6%
SE002	<0.01	<0.01%	2.1	10.7%
SE003	<0.01	<0.01%	2.5	12.6%
SE004	<0.01	<0.01%	2.1	10.7%
SE005	<0.01	<0.01%	2.1	10.5%
SE006	<0.01	<0.01%	3.6	18.2%
SE007	<0.01	0.01%	2.9	14.6%

Nitrogen deposition results

The impacts of the construction shipping assessment for nitrogen deposition are shown below in Table 5.13 for emissions at berth and

5.2.5 Table 5.14 for emissions whilst manoeuvring. The minimum critical load for nitrogen deposition used in the assessment and the relevant habitat type for each of the receptor locations was determined from data held on APIS [Ref 10] and Magic Maps [Ref 15] and is shown above in Table 3.17.

Table 5.13 Results of the construction shipping impact assessment on nitrogen deposition at ecological receptors – at berth

Ecological Receptor ID	PC nitrogen deposition (Kg N/ha/yr)	PC as % of critical load	PEC (Kg N/ha/yr)	PEC as % of min critical load
SE001	<0.01	<0.01%	13.5	270.2%
SE002	<0.01	<0.01%	12.5	250.0%
SE003	<0.01	<0.01%	13.5	135.0%
SE004	<0.01	<0.01%	13.4	268.0%
SE005	<0.01	<0.01%	12.5	250.0%
SE006	<0.01	<0.01%	13.3	266.0%
SE007	<0.01	<0.01%	12.9	129.0%

Table 5.14 Results of the construction shipping impact assessment on nitrogen deposition at ecological receptors – manoeuvring

Ecological Receptor ID	PC nitrogen deposition (Kg N/ha/yr)	PC as % of critical load	PEC (Kg N/ha/yr)	PEC as % of min critical load
SE001	<0.01	<0.01%	13.5	270.2%
SE002	<0.01	<0.01%	12.5	250.0%
SE003	<0.01	<0.01%	13.5	135.0%
SE004	<0.01	<0.01%	13.4	268.0%
SE005	<0.01	<0.01%	12.5	250.0%
SE006	<0.01	<0.01%	13.3	266.0%
SE007	<0.01	<0.01%	12.9	129.0%

Acid deposition results

5.2.6 The effects of the construction shipping assessment for acid deposition are shown below in Table 5.15 for emissions at berth and Table 5.16 for manoeuvring. The minimum critical load for acid deposition used in the assessment and the relevant habitat type for each of the receptor locations was determined from data held on APIS [Ref 10] and Magic Maps [Ref 15] and is shown above in Table 3.17

Table 5.15 Results of the construction traffic impact assessment at ecological receptors on acid deposition

Ecological receptor ID	Critical load (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition (DS-DM) as % of critical load
SE001	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE002	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE003	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE004	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE005	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE006	Min CL Min N: 0.856	< 0.1	<0.1%

Ecological receptor ID	Critical load (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition (DS-DM) as % of critical load
	Min CL Max N:4.856 Min CL Max S:4.00		
SE007	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%

Table 5.16 Results of the construction traffic impact assessment at ecological receptors on acid deposition

Ecological receptor ID	Critical load (keq/ha/yr)	DS-DM acid deposition (keq/ha/yr)	Max acid deposition (DS-DM) as % of critical load
SE001	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE002	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE003	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE004	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE005	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE006	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE007	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%

6 Conclusions

- 6.1.1 This report has assessed the potential impacts on local air quality arising from the construction phases of the Proposed Development.
- 6.1.2 The construction dust assessment has been based on the likelihood and scale of potential impact on sensitive receptors located in the vicinity of the Proposed Development. The evaluation of potential dust arisings from the construction of the Proposed Development has shown that without mitigation, there is a low to medium potential for human health (PM₁₀) impacts and a medium to high potential for dust soiling impacts.
- 6.1.3 Without mitigation, this could result in a significant effect, however IAQM guidance advises that with the implementation of appropriate mitigation measures, the effects would be **not significant**.
- 6.1.4 The mitigation measures will be set out within **Appendix 5A: fCEMP (ES Volume III, Application Document Ref 6.3)**, which will form part of the ES and will be prepared in accordance with IAQM guidance. These measures will be formalised through detailed CEMPs, to be prepared by the construction contractor and secured by Schedule 2 (Requirements) of the **Development Consent Order (Application Document Ref 3.1)**. Through implementation of these measures, effects on both human health and ecological sensitive receptors are predicted to be **not significant**.
- 6.1.5 The effect of the construction traffic associated with the Proposed Development on sensitive human receptors is considered to be not significant as the change between the DM and DS scenarios for all receptors is less than 1% of the Air Quality Assessment Levels and there are no exceedances of the air quality objectives.
- 6.1.6 For sensitive ecological receptors, it has also been determined that the effects associated with the construction traffic can also be considered to be not significant. This is due to the construction traffic data representing a highly conservative scenario, which involves assuming the peak traffic from one quarter over the four-year construction period and is likely to be much higher than the actual traffic flows. The construction period is also short-term and temporary and the impacts of nitrogen deposition are understood to only be significant in extended long-term periods.
- 6.1.6.1 The effect of the construction shipping associated with the Proposed Development on sensitive ecological receptors can be considered to be **not significant**.

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