Net Zero Teesside Project

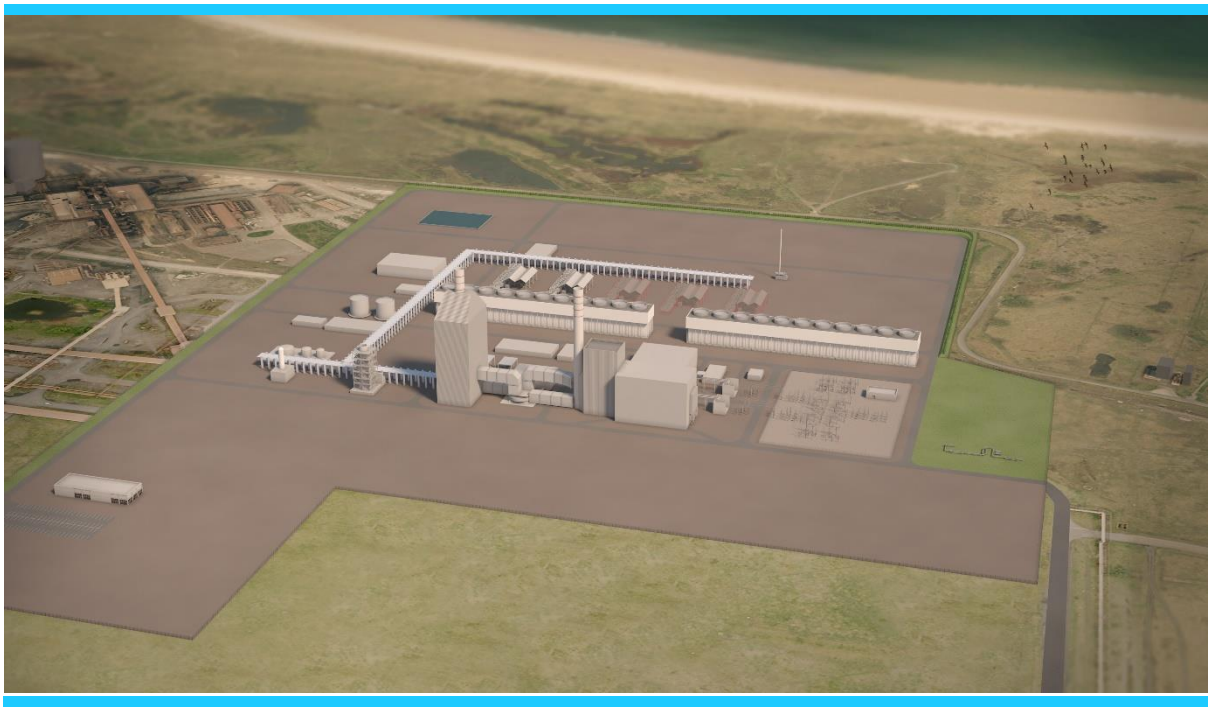
Planning Inspectorate Reference: EN010103

Land at and in the vicinity of the former Redcar Steel Works site, Redcar and in Stockton-on-Tees, Teesside

[The Net Zero Teesside Order]

Document Reference: 5.13 Habitat Regulations Assessment Report

Conservation of Habitats and Species Regulations 2017 (as amended)
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(g)



Applicants: Net Zero Teesside Power Limited (NZT Power Ltd) & Net Zero North Sea Storage Limited (NZNS Storage Ltd)

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GLOSSARY

Abbreviation	Description
ADD	Acoustic Deterrent Devices
AIA	Atmospheric Impact Assessment
APIS	Air Pollution Information Service
AQIA	Air Quality Impact Assessment
ARN	Affected Road Network
BPM	Best Practicable Means
CCGT	Combined-cycle Gas Turbine
CCU	Carbon-capture unit
CEH	Centre for Ecology and Hydrology
CEMP	Construction Environmental Management Plan
CJEU	Court of Justice of the European Union
CL	Critical load
CO_2	Carbon Dioxide
dB	Decibel
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
DPD	Development Plan Document
EC	European Commission
EEA	European Economic Area
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
FCS	Favourable Conservation Status
HDD	Horizontal Directional Drilling
HIR	Habitat Information Report
HRA	Habitat Regulations Assessment
HRSG	Heat Recovery Steam Generator
IECS	International Council for the Exploration of the Sea

Abbreviation	Description
IROPI	Imperative Reasons of Overriding Public Importance
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effects
MAGIC	Multi-Agency Geographic Information for the Countryside
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MW	Megawatt
NE	Natural England
NOx	Oxides of Nitrogen
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
NSRs	Noise Sensitive Receptors
NZT	Net Zero Teesside
NZTNS	NZT North Sea
OSPAR	Oslo-Paris Convention
PA 2008	Planning Act 2008
PAM	Passive Acoustic Monitoring
PCC	Power, Capture and Compressor
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
PTS	Permanent threshold shifts
RMP	South Tees Regeneration Master Plan
RSIS	Ramsar Sites Information Service
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCANS	Small Cetacean in European Atlantic waters and the North Seas
SIP	Site Improvement Plan
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TA	Transportation Assessment
TIN	Technical Information Note
TTS	Temporary threshold shifts
TVCA	Tees Valley Combined Authority
UXO	Unexploded Ordnance
WMP	Water Management Plan

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1.0 INTRODUCTION

1.1 Overview

1.1.1 This Habitat Regulations Assessment Report (Document Ref. 5.13 Rev ~~6~~7) has been prepared on behalf of Net Zero Teesside Power Limited and Net Zero North Sea Storage Limited (the 'Applicants'). It forms part of the application (the 'Application') for a Development Consent Order (a 'DCO'), that has been submitted to the Secretary of State (the 'SoS') for Business, Energy and Industrial Strategy, under Section 37 of 'The Planning Act 2008' (the 'PA 2008') for the Net Zero Teesside Project (the 'Proposed Development'). The Application was submitted to the SoS on 19 July 2021 and was accepted for Examination on 16 August 2021. A change request made by the Applicants in respect of the Application was accepted into the Examination by the Examining Authority on 6 May 2022. A further change request made by the Applicants in respect of the Application was accepted into the Examination by the Examining Authority in September 2022.

1.1.2 The Applicants are seeking development consent for the construction, operation and decommissioning of a Carbon Capture Usage and Storage (CCUS) project, comprising a gas-fired Combined Cycle Gas Turbine (CCGT) plant together with the equipment required for the capture and compression of carbon dioxide (CO_2) emissions from the generating station. Captured CO_2 from industrial sources and power generation will be compressed and exported for offshore geological storage under the North Sea. Refer to Chapter 4: Proposed Development [**APP-086**] of the Environmental Statement (ES) and the ES Addendum (ES Addendum Vol I Document Ref. 7.8.1) **[AS-050]** for full details of the Proposed Development.

1.1.3 A DCO is required for the Proposed Development as it falls within the definition and thresholds for a 'Nationally Significant Infrastructure Project' (a 'NSIP') under Sections 14 and 15(2) of the PA 2008.

1.2 The Proposed Development

1.2.1 The location of the Proposed Development is on the east coast of England to the west of Redcar and south of Hartlepool in an area that has been greatly modified by human development. It would lie on an existing brownfield site, formerly the Redcar Steelworks. The Proposed Development lies between Hartlepool and Middlesbrough, where the River Tees meets the North Sea. The Proposed Development site is located entirely within the boundary of the unitary authorities of Redcar and Cleveland, and Stockton-on-Tees.

1.2.2 Notably for the purposes of Habitats Regulations Assessment ('HRA'), the Power Capture and Compression ('PCC') Site, within the wider Proposed Development site, lies directly adjacent to the Teesmouth and Cleveland Coast Special Protection Area (SPA) / Ramsar, which is designated both for breeding birds (little tern, avocet and common tern) and non-breeding birds (the overall non-breeding assemblage, particularly knot, ruff, redshank and Sandwich tern), which visit the SPA between autumn and spring. The SPA and Ramsar site have recently been extended. This extension includes an area of dunes and pools immediately north-east of the PCC

Site that has been included in the designation because overwintering birds use the pools for roosting, loafing and foraging; they are therefore now recognised as essential to maintaining the integrity of the SPA / Ramsar.

1.2.3 The parts of the site boundary which cross the SPA / Ramsar and extend into Tees Bay are corridors for the underground pipeline for the offshore export of CO_2 and the existing or replacement wastewater outfalls to Tees Bay. There will be no surface works other than monitoring and surveillance within these areas.

1.2.4 Within the wider region there are also several estuarine and marine sites (e.g. the Humber Estuary Special Area of Conservation ('SAC') and the Southern North Sea SAC) that require consideration due to their mobile species, which use functionally linked habitats beyond the designated site boundaries. The term 'functional linkage' refers to the role or 'function' that land or sea beyond the boundary of a European site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified. Such habitat is therefore 'linked' to the European site in question because it provides an important role in maintaining or restoring the population of qualifying species at favourable conservation status[1].

1.2.5 For reference, a detailed description of the location of the Proposed Development in relation to relevant European sites (i.e. Special Conservation Areas (SACs), SPAs and Ramsar site, including sites going through the designation process[2]) is also provided in Chapter 3: Description of the Existing Environment [**APP-085**] and the ES Addendum (ES Addendum Vol I Document Ref. 7.8.1) [**AS-050**].

1.2.6 The Proposed Development will comprise the following main components and features (for a detailed description of the specifications of this project, please see Chapter 4: The Proposed Development [**APP-086**] of the Environmental Statement (ES) and the ES Addendum (ES Addendum Vol I, Document Ref. 7.8.1) for full details of the Proposed Development:

- The operational PCC Site, which contains a natural gas-fired generating station, comprised of one Combined Cycle Gas Turbine with an associated carbon capture plant;
- The operational power plant is to be located on part of the former Redcar Steelworks Site, directly adjacent to the Teesmouth and Cleveland Coast SPA / Ramsar;
- CO_2 Gathering Network to collect CO_2 from third-party industrial carbon capture connections and to supply this CO_2 to the compression station at the PCC Site;

[1] Description taken from Chapman, C. & Tyldesley, D. 2016. Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects - a review of authoritative decisions. Natural England Commissioned Reports, Number 207. Available at: [redacted]

[2] Note that no sites going through the designation process have been identified as being of relevance to the HRA of the Proposed Development

- CO_2 Export, consisting of a High Pressure Compressor Station at the PCC Site and a CO_2 export pipeline horizontally-direct drilled beneath the dune systems of the Teesmouth and Cleveland Coast SPA / Ramsar; and
- Other Connections, such as to gas, electricity and, most notably from an HRA perspective, water: the PCC Site is to be cooled by mechanical draft wet cooling towers that are to use water from the existing Northumbrian Water feed which will be discharged to Tees Bay via the former steelworks outfall or a replacement outfall. The replacement outfall will be constructed by micro-bored tunnelling methods.

1.3 Legislative Context

1.3.1 Further to the Habitats Directive (European Council Directive 92/43/EEC) and the Birds Directive (European Council Directive 2009/147/EEC), as part of the assessment of a proposed scheme it is necessary to consider whether the scheme is likely to have a significant effect on areas that have been designated for nature conservation purposes (i.e. 'European Sites'). This 'first stage' is the assessment that has been conducted and reported in this document.

1.3.2 Should it be found that significant effects are likely, an 'Appropriate Assessment' should then be carried out in order to further assess those effects. **Figure 1.1**~~**Figure 1.1**~~ sets out the legislative basis for an Appropriate Assessment. Consent may only be given for the proposed scheme if, following assessment, it is established that it will not adversely affect the integrity of the designated site.

1.3.3 If adverse effects are identified, alternatives should be considered to avoid those effects. However, where no alternative solution exists and so an adverse effect remains, a further assessment should be made of whether the scheme is required for imperative reasons of overriding public interest (IROPI). If the scheme meets that IROPI test, compensatory measures will be required in order to maintain the overall national site network.

1.3.4 The need for Appropriate Assessment is set out in 'The Conservation of Habitats and Species Regulations 2017 (as amended)' ('the 2017 Regulations').

1.3.5 The 2017 Regulations also apply the precautionary principle[3] to European Sites.

1.3.6 Over the years, the phrase 'Habitats Regulations Assessment' ('HRA') has come into wide currency to describe the overall process set out in the 2017 Regulations, from the screening for Likely Significant Effects through to identification of IROPI. This has arisen in order to distinguish the overall process from the individual stage of "Appropriate Assessment". Throughout this Report the term HRA is used for the

[3] The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as:
"When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis".

overall process and restricts the use of Appropriate Assessment to the specific stage of that name.

Conservation of Habitats and Species Regulations 2017 (as amended)

Regulation 63 of the 2017 Regulations states that:

"*A competent authority, before deciding to … give any consent for a plan or project which is likely to have a significant effect on a European site … must make an appropriate assessment of the implications for the plan or project in view of that site's conservation objectives… The competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site.*"

Figure 1.1: The legislative basis for Appropriate Assessment

2.0 METHODOLOGY

2.1 Introduction

2.1.1 The HRA has been carried out with reference to the general EC guidance on HRA (European Commission, 2001), general guidance on HRA published by the UK government in July 2019 (Ministry of Housing, Communities & Local Government, 2019) and Planning Inspectorate (PINS) Advice Note 10 (The Planning Inspectorate, 2017).

2.1.2 The UK left the EU on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 ("the Withdrawal Act"). This established a transition period, which is currently set to end on 31 December 2020, although it can be extended once by either one or two years if both the UK and EU agree to an extension by 1 July 2020. The Withdrawal Act also retains the body of existing EU-derived law within our domestic law. During the transition period EU law applies to and in the UK.

2.1.3 As such this assessment of LSEs takes account of relevant EU case law (for instance, the Holloman and People over Wind cases, discussed below).

2.1.4 **Figure 2.1~~Figure 2.1~~** below outlines the stages of HRA according to PINS Advice Note 10. Note that while Figure 2.1~~Figure 2.1~~ shows all the stages of the HRA process, this document only discusses stage 1 in further detail (see below). The stage 2 Appropriate Assessment will be documented as part of the Application.

2.1.5 Whilst the HRA decisions must be taken by the competent authority (The Planning Inspectorate as Examining Authority advising the Secretary of State as competent authority), the information needed to undertake the necessary assessments must be provided by the applicant. The information needed for the competent authority to establish whether there are any LSEs from the Proposed Development is therefore provided in this Report.

2.2 HRA Stage 1 – Screening for Likely Significant Effects (LSEs)

2.2.1 The objective of the LSEs test is to 'screen out' those aspects of a project and / or the European sites that can, without any detailed appraisal, be said to be unlikely to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction (i.e. a pathway) with European sites. The remaining aspects are then taken forward to Appropriate Assessment. The assessment must consider the potential for effects 'in combination' with other plans and projects.

2.2.2 This report has been prepared having regard to all relevant case law relating to the 2017 Regulations, the Habitats Directive and Birds Directive. This includes the ruling by the Court of Justice of the European Union (CJEU) in the case of People Over Wind, Peter Sweetman v Coillte Teoranta (C-323/17).

2.2.3 This case held that; "it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site" (paragraph 40). This establishes that 'mitigation measures' cannot be

taken into account at the screening stage, but they can be taken into account in an Appropriate Assessment.

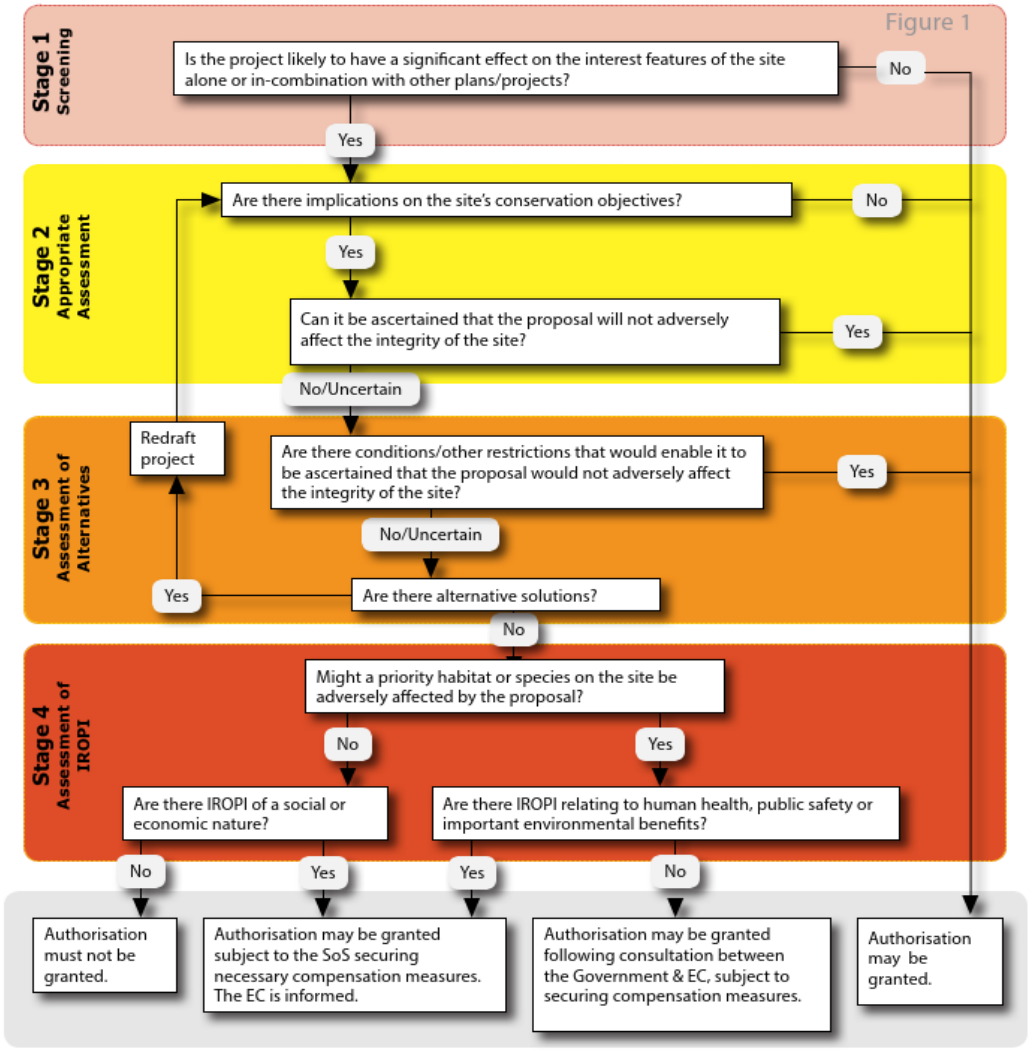

Figure 2.1: Four stage approach to Habitats Regulations Assessments of Projects

2.3 HRA Stage 2 – Appropriate Assessment

2.3.1 Where it is determined that a conclusion of 'no Likely Significant Effect' cannot be drawn, the HRA assessment proceeds to the next stage of HRA known as Appropriate Assessment. Case law has clarified that 'Appropriate Assessment' is not a technical term. In other words, there are no specific technical analyses, or level of detail, that are classified by law as belonging to Appropriate Assessment rather than the screening for LSEs. The Appropriate Assessment constitutes whatever level of further assessment is required to determine whether an adverse effect on integrity would arise.

2.3.2 By virtue of the fact that it follows the screening process, there is an understanding that the analysis will be more detailed than that undertaken at the previous stage. One of the key considerations during Appropriate Assessment is whether there is available mitigation that would address the potential effect, allowing for a conclusion

of no adverse effect on integrity. In practice, the Appropriate Assessment takes any element of the Proposed Development that could not be excluded as having LSEs following HRA Stage 1 and assesses the potential for an effect in more detail, with a view to concluding whether there would be an adverse effect on site integrity. Adverse effects on site integrity include disruption of the coherent structure and function of the European site(s) and the ability of the site to achieve its conservation objectives.

2.3.3 In 2018 the Holohan ruling was handed down by the European Court of Justice. Among other provisions paragraph 39 of the ruling states that *'As regards other habitat types or species, which are present on the site, but for which that site has not been listed, and with respect to habitat types and species located outside that site, … typical habitats or species must be included in the appropriate assessment, if they are necessary to the conservation of the habitat types and species listed for the protected area'* [emphasis added]. This ruling has been considered in relation to the Proposed Development and European sites that are linked to the proposal via an impact pathway. For example, the Southern North Sea SAC is designated for harbour porpoise, which range vast distances beyond the designated site boundary. Harbour porpoise are known to regularly forage within the lower stretches of the River Tees and potential impacts of the Proposed Development on habitat use in the lower Tees require assessment.

The Rochdale Envelope

2.3.4 In July 2018, the Planning Inspectorate published Advice Note Nine: Rochdale Envelope (The Planning Inspectorate, 2018), explaining how the principles of the Rochdale Envelope should be used by planning applications for the Environmental Impact Assessment (EIA) process.

2.3.5 The Rochdale Envelope[4] is applicable where some of the details of a Proposed Development cannot be confirmed when an application is submitted, and flexibility is needed to address uncertainty. Notwithstanding, all significant potential effects of a Proposed Development must be properly addressed.

2.3.6 It encompasses three key principles:

- The assessment should use a cautious worst-case approach;
- The level of information assessed should be sufficient to enable the Likely Significant Effects of a Proposed Development to be assessed; and
- The allowance for flexibility should not be abused to provide inadequate descriptions of projects.

[4] The Rochdale Envelope arises from two cases: R. v Rochdale MBC ex parte Milne (No.1) and R. v Rochdale MBC ex parte Tew [1999], which are cases that dealt with outline planning applications for a proposed business park in Rochdale.

2.3.7 This HRA has given due consideration to the Rochdale Envelope. The worst-case (i.e. the potentially most impactful) construction/decommissioning and operational scenarios have been assessed in relation to impact pathways. For the operational air quality assessment, the CCGT assessed is worst case in terms of emissions from the H-class CCGTs that are available on the market.

2.3.8 Throughout this HRA construction impacts and decommissioning impacts on European sites are likely to be very similar in type, magnitude and effect. As such they are treated together.

3.0 BASELINE EVIDENCE GATHERING

3.1 Scope of the Project

3.1.1 There is no guidance that dictates the general physical scope of an HRA. Therefore, in considering the physical scope of the assessment, we were guided primarily by the identified impact pathways (called the source-pathway-receptor model).

3.1.2 Briefly defined, impact pathways are routes by which the implementation of a project can lead to an effect upon a European designated site. An example of this would be visual and noise disturbance arising from the construction/decommissioning work or operational phase associated with a project. If there are sensitive ecological receptors within a nearby European site (e.g. non-breeding overwintering birds), this could alter their foraging and roosting behaviour and potentially affect the site's integrity. For some impact pathways (notably air pollution) there is guidance that sets out distance-based zones required for assessment. For others, a professional judgment must be made based on the best available evidence.

3.2 Relevant European sites

3.2.1 Guidance published by the Environment Agency (Environment Agency, 2016) recommends that for large power generation developments greater than 50 MW, a radius of search of 15 km should be used when identifying relevant European designated sites which may be affected by the development. The following European sites (as shown on Figure 1 in Appendix D) were identified within a 15 km radius of the Proposed Development:

- the Teesmouth and Cleveland Coast SPA / Ramsar;
- North York Moors SAC/SPA;
- Durham Coast SAC; and
- Northumbria Coast SPA and Ramsar.

3.2.2 Therefore, these are the European sites covered by the air quality impact assessment and discussed in the part of this HRA dealing with that pathway.

3.2.3 In addition to air quality there are several other impact pathways identified to the Teesmouth and Cleveland Coast SPA/Ramsar site such as construction/decommissioning and operational disturbance, direct temporary habitat impact and water quality and hydrological impacts. This European site is therefore the focus of the assessment. The location of this site in respect of the Proposed Development is shown on Figure 3 in Appendix D.

3.2.4 Some impact pathways such as disruption of fish migration can affect sites considerably further afield than 15km. As a precaution, potential impact pathways to relevant European sites designated marine mammals and migratory fish are therefore also considered in this HRA.

3.2.5 Given the location of the Proposed Development, the relevant European sites and the likely impact pathways present, this HRA needs to discuss the following European sites:

- Teesmouth and Cleveland Coast SPA / Ramsar;
- Durham Coast SAC;
- North York Moors SAC;
- North York Moors SPA;
- Berwickshire and North Northumberland Coast SAC;
- Northumbria Coast SPA / Ramsar;
- The Wash and North Norfolk Coast SAC;
- Humber Estuary SAC;
- Southern North Sea SAC;
- River Tweed SAC; and
- Tweed Estuary SAC.

3.2.6 It is to be noted that some of the European sites included above lie at considerable distances from the Proposed Development. Some sites are designated for marine mammals (Berwickshire and North Northumberland Coast SAC, the Wash and North Norfolk SAC, the Humber Estuary SAC and the Southern North Sea SAC) or migratory fish (River Tweed SAC and Tweed Estuary SAC). These qualifying species range great distances, potentially using the waters around the Proposed Development. The North York Moors SAC / SPA and Northumbria Coast SPA / Ramsar is considered in the context of operational stack emissions from the operational power plant, which have the potential to affect European sites that lie relatively far from industrial developments. Therefore, the above sites have been screened in for Appropriate Assessment. The location of these sites in relation to the Proposed Development is shown on Figure 2: Designated Sites in Appendix D.

3.2.7 The Teesmouth and Cleveland Coast Wetland of International Importance (a Ramsar site), which is largely contiguous with the Teesmouth and Cleveland Coast SPA, must be considered in this HRA assessment. Although Ramsar sites are not explicitly covered by the Conservation of Habitats and Species Regulations (2017), paragraph 176 of the National Planning Policy Framework (NPPF) in England extends Ramsar sites the same level of protection as SPAs and SACs.

3.2.8 An introduction to and a summary of the qualifying features, Conservation Objectives and threats / pressures to site integrity of the Teesmouth and Cleveland Coast SPA / Ramsar (and its extension), and the European sites designated for marine mammals and migratory fish, is provided in the following section.

3.2.9 Paragraph 4.9 of PINS Advice Note Ten requires an evaluation of the potential for the Scheme Project to require other consents which could also require Habitats

Regulations Assessment by different competent authorities, and a statement as to whether the Scheme boundary overlaps with devolved administrations or other European Economic Area (EEA) States. The HRA that accompanies the Application will therefore include a discussion of the 'in combination' effects of the export pipeline which is subject to a separate consenting regime. It is confirmed that the Scheme boundary does not overlap with areas of devolved administrations or with those of other EEA States.

Teesmouth and Cleveland Coast SPA / Ramsar

Introduction

3.2.10 The Teesmouth and Cleveland Coast SPA / Ramsar (JNCC, 2001a) is a 12,210.62ha estuarine and coastal site located on the north-eastern coast of England. It comprises a range of coastal habitats, such as sand- and mudflats, rocky shore, saltmarsh, freshwater marsh and sand dunes. The SPA / Ramsar lies along a stretch of coast that has been significantly modified by human activity. The site provides feeding and roosting opportunities for a significant number of waterfowl in winter and the passage period. Furthermore, little tern *Sterna albifrons* breed on beaches within the site during summer and sandwich tern *Sterna sandvicensis* use the SPA / Ramsar as a stop-over location on passage.

SPA Qualifying Features

3.2.11 The site qualifies as a SPA under Article 4.1 of the Birds Directive (79/409/EEC) by supporting populations of the following features, as per the Conservation Objectives for the SPA updated in May 2020:

- *Recurvirostra avosetta*; Pied avocet (Breeding)
- *Calidris canutus*; Red knot (Non-breeding)
- *Calidris pugnax*; Ruff (Non-breeding)
- *Tringa totanus*; Common redshank (Non-breeding)
- *Sterna sandvicensis*; Sandwich tern (Non-breeding)
- *Sterna hirundo;* Common tern (Breeding)
- *Sterna albifrons*; Little tern (Breeding)
- Waterbird assemblage

3.2.12 A Technical Information Note (TIN) was prepared by Natural England in July 2015 regarding a potential extension to the Teesmouth and Cleveland Coast SPA / Ramsar (Natural England, 2015a). This was done to improve seabird protection within the SPA network. The following were the primary reasons for the proposed extension:

- Protecting common tern *Sterna hirundo* and avocet *Recurvirostra avosetta* as new breeding qualifying features within the SPA;
- Extending the boundary of the SPA into the marine environment to protect foraging opportunities for little tern *Sterna albifrons* and common tern; and

- Including functionally linked terrestrial habitats that support breeding common tern and avocet, and non-breeding waterbirds.

3.2.13 The suggestion for a marine extension to the SPA was based on shore-based and boat-based surveys of marine waters surrounding the little tern colony at Crimdon Dene. Terns are central place foragers, which means they return to a central place (their nest) after each foraging trip. This means that there is a strong energetic incentive to forage as close to the nest as possible. Therefore, based on both survey and modelling data, NE recommended that the marine waters extending between 3.5 and 6km from known tern colonies should be protected.

3.2.14 Natural England also reviewed Wetland Bird Survey core count data for breeding avocet and common tern, and non-breeding waterfowl in terrestrial habitats adjoining the SPA / Ramsar (as currently identified). This has shown that some terrestrial habitats (e.g. intertidal zones, dunes, wet grassland, reedbeds) are used by significant numbers of SPA / Ramsar birds. These areas have also been recommended for inclusion into the SPA / Ramsar and are treated in this HRA as if fully designated.

3.2.15 The extension was formally included within the SPA/Ramsar site in early 2020.

Ramsar Qualifying Features (RSIS, 2000a, updated to take account of the 2020 extension)

3.2.16 The site qualifies as a Ramsar for the following Ramsar criteria:

- Criterion 5 - Assemblages of international importance
  - Species with peak counts in winter
    - 26,786 waterfowl (5 year peak mean 2011/12-2015/16)
- Criterion 6 – Species/populations occurring at levels of international importance
  - Qualifying Species/populations (as identified at designation)
  - Species with peak counts in spring / autumn:
    - Common redshank *Tringa totanus*; 1,648 individuals representing an average of 1.1% of the East Atlantic population (1987-91)
  - Species with peak counts in winter:
    - Red knot *Calidris canutus islandica*; 5,509 individuals representing an average of 1.6% of the NE Canada/Greenland/Iceland/UK population (5 year peak mean 1991/92-1995/96)
    - Sandwich tern Thalasseus sandvicensis; 1,900 individuals representing an average of 4.3% of the GB population (1988-1992)

3.2.17 SPA Conservation Objectives (Natural England, 2020a)

3.2.18 With regard to the SPA and the individual species and/or assemblage of species for which the site has been, or may be, classified (the 'Qualifying Features' including the 'Additional Qualifying Features' listed below), and subject to natural change (Natural England, 2020a); the conservation objectives are to:

3.2.19 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

Threats / Pressures to Site Integrity (Natural England, 2014b)

3.2.20 The following threats / pressures to the site integrity of the Teesmouth and Cleveland Coast SPA have been identified in Natural England's Site Improvement Plan (Natural England, 2014b):

- Physical modification;
- Public access / disturbance;
- Direct land take from development;
- Water pollution;
- Fisheries: Commercial marine and estuarine;
- Fisheries: Recreational marine and estuarine;
- Undergrazing;
- Inappropriate water levels;
- Predation;
- Coastal squeeze;
- Change to site conditions; and
- Air pollution: Impact of atmospheric nitrogen deposition.

North York Moors SAC

Introduction

3.2.21 The North York Moors SAC is a 44,053.29ha large site that comprises a variety of habitats, most notably heath and scrub (73%), dry grassland (15%), and bogs and marshes (4%). The site lies in north-east Yorkshire within the North York Moors National Park and contains the largest contiguous area of upland heather moorland in England.

3.2.22 Half the site is covered by dry heath, which forms the main vegetation type on the western, southern and central moors. Wet heath is the second most dominant habitat that is found in the eastern and northern moors, where the soil is not as free-draining. Together the heathland components are the primary reason for qualifying the SAC.

3.2.23 Blanket bog is also a qualifying feature, which occurs along the watersheds of some of the high moors on relatively deep peat. The blanket bog areas are managed for grouse through rotational burning and extensive sheep grazing. In recent decades bracken has become dominant in areas that used to harbour ericaceous species. The site comprises boggy flushes with rushes and mires with Sphagnum mosses and sedges. The SAC, particularly the bog elements, support populations of upland breeding bird species including merlin and golden plover (see the North York Moors SPA below).

Qualifying Features (JNCC, 2020a)

- Annex I habitats that are a primary reason for selection of this site:
  - Northern Atlantic wet heaths with *Erica tetralix*; and
  - European dry heaths
- Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:
  - Blanket bogs

Conservation Objectives (Natural England, 2014c)

3.2.24 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

3.2.25 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of the qualifying natural habitats;
- The structure and function (including typical species) of the qualifying natural habitats; and
- The supporting processes on which the qualifying natural habitats rely

Threats / Pressures to Site Integrity (Natural England, 2014d)

3.2.26 The following threats / pressures to the site integrity of the North York Moors SAC have been identified in Natural England's Site Improvement Plan:

- Climate change;
- Air pollution: Impact of atmospheric nitrogen deposition;
- Disease;

- Invasive species;
- Managed rotational burning;
- Planning permission: Mineral and waste;
- Game management: Grouse Moors;
- Changes in species distributions;
- Agriculture;
- Energy production;
- Wildfire / arson.

North York Moors SPA

Introduction

3.2.27 The upland moorland that represents the qualifying habitat of the North York Moors SAC (described above) also supports significant populations of upland breeding birds, in particular golden plover and merlin.

Qualifying Features (JNCC, 2001b)

- Annex II species that are a primary reason for selection of this site:
  - Merlin *Falco columbianus*; 526 pairs representing at least 2.3% of the breeding population in Great Britain (numbers are at time of designation); and
  - European golden plover *Pluvialis apricaria*; 40 pairs representing at least 3.1% of the breeding population in Great Britain

Conservation Objectives (Natural England, 2014e)

3.2.28 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

3.2.29 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;
- The supporting processes on which the habitats of the qualifying features rely;
- The population of each of the qualifying features; and
- The distribution of the qualifying features within the site.

Threats / Pressure to Site Integrity

3.2.30 The following threats / pressures to the site integrity of the North York Moors SPA have been identified in Natural England's Site Improvement Plan:

- Climate change;
- Air pollution: Impact of atmospheric nitrogen deposition;
- Disease;
- Invasive species;
- Managed rotational burning;
- Planning permission: Mineral and waste;
- Game management: Grouse Moors;
- Changes in species distributions;
- Agriculture;
- Energy production; and
- Wildfire / arson.

Durham Coast SAC

Introduction

3.2.31 The Durham Coast SAC is a 389.61ha site comprising coastal sand dunes (43%), shingle / sea cliffs (31%), marine areas (21%) and humid grassland (5%). It is the only example of a vegetated sea cliff on Magnesian Limestone in the UK, extending along the North Sea coastline for 20km.

3.2.32 The SAC's vegetation is unique in the British Isles, consisting of a mosaic of calcareous and neutral grasslands, tall-herb fen, seepage flushes and wind-pruned scrub. These habitats harbour a wide range of species with varied ecological niches and requirements, often including rare or scarce species. The Durham Coast SAC also supports significant populations of breeding seabirds, wintering waders and rare invertebrates, such as the Durham argus *Aricia Artaxerxes salmacisi*.

Qualifying Features (JNCC, 2015b)

- Annex I habitats that are a primary reason for selection of this site:
  - Vegetated sea cliffs of the Atlantic and Baltic Coasts

Conservation Objectives (Natural England, 2014f)

3.2.33 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

3.2.34 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which the qualifying natural habitats rely.

Threats / Pressures to Site Integrity (Natural England, 2014g)

3.2.35 The following threats / pressures to the site integrity of the Durham Coast SAC have been identified in Natural England's Site Improvement Plan:

- Natural changes to site conditions;
- Inappropriate coastal management;
- Invasive species;
- Fertiliser use;
- Vehicles: Illicit;
- Changes to site conditions; and
- Public access / disturbance.

Northumbria Coast SPA / Ramsar

Introduction

3.2.36 The Northumbria Coast SPA comprises several discrete sections of rocky foreshore between the north of Northumberland and the County Durham. The site also includes an area of sandy beach. The SPA largely includes cliffs, crags / ledges, intertidal rock, open coast and pools. The site is subject to a range of recreational activities, including walking, sea angling, birdwatching and water sports.

3.2.37 The SPA was classified in 2000 for supporting internationally important populations of over-wintering purple sandpiper and turnstone, and a breeding colony of little tern at Beadnell Bay.

SPA Qualifying Features (JNCC, 2018)

3.2.38 Annex I species that are a primary reason for selection of this site:

- Arctic tern *Sterna paradisaea*; 1,549 pairs representing 2.92% of the GB population
- Little tern *Sternula albifrons*; 40 pairs representing 1.7% of the GB population

3.2.39 Annex II species that are a primary reason for selection of this site:

- Turnstone *Arenaria interpres*; 1,739 individuals representing 2.6% of the biogeographic population
- Purple sandpiper *Calidris maritima*; 787 individuals representing 1.6% of the biogeographic population

Ramsar Qualifying Features (RSIS, 2000b)

3.2.40 The site qualifies as a Ramsar for the following Ramsar criteria:

- Criterion 6 - Species/populations occurring at levels of international importance
  - Qualifying Species/populations (as identified at designation)
  - Species with peak counts in winter:
    - Purple sandpiper *Calidris maritima*; 787 individuals representing an average of 1.6% of the population (5 year peak mean for 1992/93 to 1996/97)
    - Turnstone *Arenaria interpres*; 1,739 individuals representing an average of 2.6% of the population (5 year peak mean for 1992/93 to 1996/97)
  - Species with peak counts during the breeding season:
    - Little tern *Sterna albifrons*; 40 pairs representing an average of 1.7% of the GB population (5 year mean for 1993 to 1997)

SPA Conservation Objectives (Natural England, 2014h)

3.2.41 With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

3.2.42 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

Threats / Pressures to Site Integrity (Natural England, 2015b)

3.2.43 The following threats / pressures to the site integrity of the Northumbria Coast SPA have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance;
- Water pollution;
- Invasive species;
- Changes in species distributions;
- Predation;
- Coastal squeeze;

- Direct impact from third party;
- Transportation and service corridors;
- Change in land management;
- Air pollution: Risk of atmospheric nitrogen deposition; and
- Fisheries: Commercial marine and estuarine.

Berwickshire and North Northumberland Coast SAC

Introduction

3.2.44 The Berwickshire and North Northumberland Coast SAC is a 65,226.12ha site in north-east England comprising a variety of habitats, including marine areas / sea inlets (73.2%), tidal rivers and estuaries (13.4%), coastal sand dune (4.5%) and shingle / sea cliffs (6.7%).

3.2.45 The SAC comprises an extensive stretch of intertidal sand- and mudflats, which range from wave-exposed beaches to sheltered muddy flats. Parts of these harbour the largest intertidal beds of narrow-leaved eelgrass *Zostera angustifolia* and dwarf eelgrass *Z. noltei*. Some of the beds harbour large beds of mussels, sand-eels, small crustaceans and polychaete worms.

3.2.46 Furthermore, the SAC comprises an extensive stretch of reef coastline. The subtidal rocky reefs harbour rich marine communities. The community variety is due to the wide range of physical conditions in the area, ranging from wave-exposed locations, open coast to sheltered reefs. The Farne Islands are especially important because they are some of the few rocky islands with extensive reefs.

3.2.47 It is the most south-easterly site selected for grey seal, supporting around 2.5% of the annual UK pup production.

Qualifying Features (JNCC, 2020b)

3.2.48 Annex I habitats that are a primary reason for selection of this site:

- Mudflats and sandflats not covered by seawater at low tide;
- Large shallow inlets and bays;
- Reefs; and
- Submerged or partially submerged sea caves.

3.2.49 Annex II species that are a primary reason for selection of this site:

- Grey seal Halichoerus grypus

Conservation Objectives (Natural England, 2014i)

3.2.50 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

3.2.51 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

Threats / Pressures to Site Integrity (Natural England, 2015b)

3.2.52 The following threats / pressures to the site integrity of the Berwickshire and North Northumberland Coast SAC have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance;
- Water pollution;
- Invasive species;
- Changes in species distribution;
- Predation;
- Coastal squeeze;
- Transportation and service corridors;
- Change in land management;
- Air pollution: Risk of atmospheric nitrogen deposition; and
- Fisheries: Commercial marine and estuarine.

<u>The Wash and North Norfolk Coast SAC</u>

Introduction

3.2.53 The Wash is the largest marine embayment (107,718ha) with the second largest intertidal sediment flats in the country. It comprises extensive fine sand and coarse sand banks, which support a community of polychaetes, bivalves and crustaceans. Some unusual communities also occur, including brittlestar beds and reef-building ross worm *Sabellaria spinulosa*.

3.2.54 The North Norfolk Coast is the only British example of a barrier beach system, with extensive areas of saltmarsh with characteristic creek patterns having developed

behind sand and shingle spits and bars. Communities include the bivalve peppery furrow shell *Scrobicularia plana* and lugworm *Arenicola marina.* In the more exposed open coast areas the infauna is sparser.

3.2.55 The SAC is important for breeding and moulting of one of Europe's largest populations of common seal *Phoca vitulina*. Furthermore, the intertidal mudflats and salt marshes represent one of Britain's most important winter feeding areas for waders and wildfowl.

Qualifying Features (JNCC, 2020c)

3.2.56 Annex I habitats that are a primary reason for selection of this site:

- Sandbanks which are slightly covered by sea water all the time;
- Mudflats and sandflats not covered by seawater at low tide;
- Large shallow inlets and bays;
- Reefs;
- Salicornia and other annuals colonizing mud and sand;
- Atlantic salt meadows (*Glauco-Puccinelllietalia maritimae*); and
- Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticose*).

3.2.57 Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Coastal lagoons

3.2.58 Annex II species that are a primary reason for selection of this site:

- Harbour seal *Phoca vitulina*

3.2.59 Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Otter *Lutra lutra*

Conservation Objectives (Natural England, 2014j)

3.2.60 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;
  - The extent and distribution of qualifying natural habitats and habitats of qualifying species;
  - The structure and function (including typical species) of qualifying natural habitats;

- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

Threats / Pressures to Site Integrity (Natural England, 2014k)

3.2.61 The following threats / pressures to the site integrity of The Wash and North Norfolk Coast SAC have been identified in Natural England's Site Improvement Plan:

- Inappropriate water levels;
- Public access / disturbance;
- Siltation;
- Fisheries: Recreational marine and estuarine;
- Invasive species;
- Inappropriate coastal management;
- Fisheries: Commercial marine and estuarine;
- Predation;
- Coastal squeeze;
- Change in land management;
- Air pollution: Impact of atmospheric nitrogen deposition; and
- Changes in species distributions.

Humber Estuary SAC

Introduction

3.2.62 The Humber Estuary SAC is a 36,657.15ha large estuarine site in north-eastern England comprising a variety of habitats, including tidal rivers / estuaries (94.9%), saltmarsh (4.4%), coastal sand dunes (0.4%) and bogs / marshes (0.4%).

3.2.63 The SAC is a large macro-tidal coastal plain estuary with high suspended sediment loads. It is a dynamic system that feeds accreting and eroding intertidal and subtidal sand- and mudflats, saltmarsh and reedbeds. It also harbours a range of sand dune types, sandbanks and coastal lagoons. Salinity declines upstream, giving rise to tidal reedbeds and brackish saltmarsh communities. The SAC harbours a significant fish assemblage, including river lamprey and sea lamprey.

3.2.64 The estuary is a favoured feeding site for wintering and passage wildfowl, which forage in the different habitats of the SPA. The sandy habitats attract knot and grey plover, while waterfowl prefer the wetland zones. At high tide, mixed flocks of birds

occupy key roost sites, which are under pressure due to the combined effects of land claim, coastal squeeze and habitat loss.

Qualifying Features (JNCC, 2020d)

3.2.65 Annex I habitats that are a primary reason for selection of this site:

- Estuaries; and
- Mudflats and sandflats not covered by seawater at low tide.

3.2.66 Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Sandbanks which are slightly covered by sea water all the time;
- Coastal lagoons;
- Salicornia and other annuals colonizing mud and sand;
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);
- Embryonic shifting dunes;
- Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes");
- Fixed coastal dunes with herbaceous vegetation ("grey dunes"); and
- Dune with *Hippopha rhamnoides*.

3.2.67 Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Sea lamprey *Petromyzon marinus*;
- River lamprey *Lampetra fluviatilis*; and
- Grey seal *Halichoerus grypus*.

Conservation Objectives (Natural England, 2020b)

3.2.68 With regard to the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

3.2.69 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;

- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site

Threats / Pressures to Site Integrity (Natural England, 2020c)

3.2.70 The following threats / pressures to the site integrity of the Humber Estuary SAC have been identified in Natural England's Site Improvement Plan:

- Water pollution;
- Coastal squeeze;
- Changes in species distributions;
- Undergrazing;
- Invasive species;
- Natural changes to site conditions;
- Public access / disturbance;
- Fisheries: Fish stocking;
- Fisheries: Commercial marine and estuarine;
- Direct land take from development;
- Air pollution: Impact of atmospheric nitrogen deposition;
- Shooting / scaring; and
- Inappropriate scrub control.

Southern North Sea SAC

Introduction

3.2.71 The Southern North Sea SAC is a large (3,695,054ha), offshore site comprising entirely marine habitat (100%). Its purpose is to protect the primary habitat for harbour porpoise (*Phocoena phocoena*), which uses a network of habitat patches in the North Sea.

3.2.72 Harbour porpoise display seasonal differences in the relative use of marine habitats. The SAC was identified using harbour porpoise sightings data to identify areas that consistently harboured elevated densities of harbour porpoise. The SAC has been designated due to its importance for porpoise both in the summer and winter months.

Qualifying Features (JNCC, 2020e)

3.2.73 Annex II species that are a primary reason for selection of this site:

- Harbour porpoise *Phocoena phocoena*

Conservation Objectives (JNCC and Natural England, 2019)

3.2.74 To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site;
- There is no significant disturbance of the species; and
- The condition of supporting habitats and processes, and the availability of prey is maintained.

Threats / Pressures to Site Integrity

3.2.75 The following threats / pressures to the site integrity of the Southern North Sea SAC have been identified based on the site's qualifying feature:

- Water pollution;
- Changes in species distributions;
- Fisheries: Commercial marine and estuarine;
- Construction of offshore and coastal infrastructure projects (e.g. wind farms, pipelines, harbours); and
- Noise disturbance.

River Tweed SAC

Introduction

3.2.76 The River Tweed SAC is the most species-rich river with *Ranunculus* in the north-eastern part of its range. It has high ecological diversity which is partly due to its diverse geological setting. Examples of its vegetation include stream water-crowfoot *Ranunculus penicillatus*, fan-leaved water-crowfoot *R. circinatus* and common water-crowfoot R. aquatilis. The river is also designated for its significant assemblage of Atlantic salmon *Salmo salar*, otter *Lutra lutra*, sea lamprey *Petromyzon marinus*, brook lamprey *Lampetra planeri* and river lamprey *Lampetra fluviatilis*.

Qualifying Features (JNCC, 2020f)

3.2.77 Annex I habitats that are a primary reason for selection of this site:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

3.2.78 Annex II species that are a primary reason for selection of this site:

- Atlantic salmon *Salmo salar*; and
- Otter *Lutra lutra.*

3.2.79 Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Sea lamprey Petromyzon marinus;
- Brook lamprey Lampetra planeri; and
- River lamprey Lampetra fluviatilis.

Conservation Objectives (Natural England, 2014l)

3.2.80 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

3.2.81 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

Threats / Pressures to Site Integrity (Natural England, 2014m)

3.2.82 The following threats / pressures to the site integrity of the River Tweed SAC have been identified in Natural England's Site Improvement Plan:

- Water pollution;
- Invasive species;
- Physical modification; and
- Water abstraction.

Tweed Estuary SAC

Introduction

3.2.83 The Tweed Estuary SAC is a 156.24ha European site, comprising tidal rivers / estuaries (90%) and salt marsh (10%). The SAC is a long and narrow estuary that discharges into the North Sea. Its water quality is classified as excellent throughout, supporting a wide range of habitats. These include substantial sandbanks, areas of rocky shore (at its mouth), estuarine boulders and cobbles (further upstream). The most exposed sandy shores are subject to wave action from the sea and scouring from the outflowing river. Species and habitats reflect these conditions, with diversity decreasing with increasing exposure.

3.2.84 The SAC also harbours intertidal sand- and mudflats. The sand is subject to wave action and scouring by the river, which is reflected by a mobile infaunal community consisting mainly of crustaceans and few polychaetes. More sheltered areas of the estuary support robust polychaetes, amphipods, oligochaetes and enchytraeids.

Qualifying Features (JNCC, 2020g)

3.2.85 Annex I habitats that are a primary reason for selection of this site:

- Estuaries; and
- Mudflats and sandflats not covered by seawater at low tide.

3.2.86 Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Sea lamprey *Petromyzon marinus*; and
- River lamprey *Lampetra fluviatilis*.

Conservation Objectives (Natural England, 2014n)

3.2.87 With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change; the conservation objectives are to:

3.2.88 Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

Threats / Pressures to Site Integrity (Natural England, 2015)

3.2.89 The following threats / pressures to the site integrity of the Tweed Estuary SAC have been identified in Natural England's Site Improvement Plan:

- Public access / disturbance;
- Water pollution;
- Invasive species;
- Changes in species distribution;

- Predation;
- Coastal squeeze;
- Transportation and service corridors;
- Change in land management;
- Air pollution: Risk of atmospheric nitrogen deposition; and
- Fisheries: Commercial marine and estuarine.

4.0 TEST OF LIKELY SIGNIFICANT EFFECTS

4.1 Introduction

4.1.1 This section examines the LSEs of the Proposed Development. It is structured by development phase (i.e. first by construction/decommissioning period since the impacts during these periods will be essentially identical, then by operational period).

4.1.2 Within each development phase each potential impact pathway (e.g. noise & visual disturbance, air quality etc.) is discussed separately, covering all European sites to which that impact pathway applies. Each European site to which an impact pathway potentially applies is considered below under the heading describing the type of impact. The analysis is summarised in the screening matrices in Appendix B of this HRA.

4.2 Construction/Decommissioning Period

Visual and noise disturbance

4.2.1 The Natural England Site Improvement Plan (SIP) for the Teesmouth and Cleveland Coast SPA / Ramsar (and its extension) highlights that the site is sensitive to public access and disturbance, primarily as a result of recreational users accessing the beach (Natural England, 2014b). This recreational pressure effect is primarily due to the birds responding to visual and (probably to a lesser extent) auditory stimuli, which also result from the construction / decommissioning or operation of nearby industrial plants. Therefore, it is considered that the SPA / Ramsar is sensitive to visual and noise disturbance associated with the Proposed Development.

4.2.2 A study on recreational disturbance in the Humber (Liley & Cruickshanks, 2012) assesses different types of noise disturbance on waterfowl referring to studies relating to aircraft (see Drewitt, 1999), traffic (Reijnen, Foppen, & Veenbaas, 1997), dogs (Lord, Waas, & Innes 1997; Banks & Bryant 2007) and machinery (Delaney et al, 1999; Tempel & Gutierrez, 2003). These studies identified that there is still relatively little work on the effects of different types of water-based craft and the impacts from jet skis, kite surfers, windsurfers etc. (see Kirby et al, 2004 for a review). Some types of disturbance are clearly likely to invoke different responses. In very general terms, both distance from the source of disturbance and the scale of the disturbance (noise level, group size) will influence the response (Delaney et al, 1999; Beale & Monaghan, 2005). On UK estuaries and coastal sites, a review of WeBS data showed that, among the volunteer WeBS surveyors, driving of motor vehicles and shooting were the two activities most perceived to cause disturbance (Robinson & Pollitt, 2002).

4.2.3 The degree of impact that varying levels of noise will have on different species of bird is relatively poorly understood. Research published by the Institute of Estuarine & Coastal Studies in 2013, summarises the key evidence base relating to this impact

pathway[5]. Based on the observed responses of waterbirds to noise stimuli, an acceptable receptor dose (i.e. maximum noise level at the bird) of 'below 70 dB' has been identified in discussion with Natural England on schemes in other parts of England and elsewhere on the Tees. Twice in discussions over this Proposed Development (most recently on 30th April 2021) Natural England officers have reiterated that they consider the 70 dB metric is appropriate to use for impact assessment regarding this SPA / Ramsar site.

4.2.4 On other projects, the change in the noise levels experienced by birds, rather than an absolute noise threshold, is used as an alternative means of impact assessment. However, in this case Natural England have confirmed that the birds of the SPA / Ramsar site are tolerant of a wide range of noise variation, including levels higher than those to which they are currently exposed at Coatham Dunes.

4.2.5 The Proposed Development will involve construction / decommissioning of the PCC Site and the construction of utility corridors, such as for gas and water and for the CO_2 export pipeline. The Teesmouth and Cleveland Coast SPA/Ramsar site harbours qualifying species throughout the entire year (breeding terns and avocet in summer and non-breeding waders in winter), and visual and noise disturbance associated with construction / decommissioning work is thus not a seasonal issue. It requires consideration throughout the entire year. However, only some parts of the SPA / Ramsar are used for nesting by the breeding species.

4.2.6 Given that that the SPA / Ramsar is directly adjacent to the Teesworks Site and the water discharge area, it is possible that construction / decommissioning activities in any of these site areas could result in visual disturbance of the SPA's / Ramsar's waterfowl if it takes place during the passage or winter period (i.e. October to March inclusive), or to the nesting tern and avocet for which the SPA / Ramsar is designated if it takes place during the breeding period (i.e. March to June), depending on location.

4.2.7 It is also possible that noise disturbance may occur depending on the noise levels arising from the construction / decommissioning works in the SPA / Ramsar. Therefore, it is concluded that the Proposed Development will result in LSEs on the SPA / Ramsar birds regarding noise disturbance. The current Construction Programme anticipates that piling will be needed for the main foundations of the stack, HRSG and turbine hall, due to the anticipated ground conditions. It has been confirmed that bored piling is recommended for installing all piles.

4.2.8 In addition to noise, large structures (e.g. tall buildings, bridges and wind turbines) can change the behaviour of birds by affecting their sight- and flight lines. This can result in a collision risk barrier effect or displacement, which could make birds more

[5] The University's research is available at the following link: [redacted].

vulnerable to predation or result in the loss of foraging habitat. The maximum building height and the average building height of the Proposed Development are the main parameters to consider regarding the potential impact of tall buildings. The stack for the carbon capture plant absorber will have a maximum height of 115m above ground level. The average building height for the frontage (calculated from all individual components) will be around 40m. These are not materially greater than the general existing or different from the historic building/structure elevations in this area which have nonetheless enabled a high wintering waterfowl interest to develop. Moreover, it is considered that the qualifying species of the Teesmouth and Cleveland Coast SPA / Ramsar do not routinely use functionally linked habitats inland from the designated sites, other than those areas now encompassed by the SPA and Ramsar designations. Instead, it is expected that most of these birds will move between foraging areas along the coastline. Therefore, it is concluded that the Proposed Development will not result in LSEs on the SPA / Ramsar birds regarding disturbance of the sight- and / or flightlines of SPA / Ramsar birds.

4.2.9 Construction / decommissioning of the main buildings and infrastructure associated with the project, particularly the PCC Site and the CO_2 Export Pipeline is screened in for Appropriate Assessment due to the potential for noise and potentially visual disturbance of the non-breeding and breeding interest features of the Teesmouth & Cleveland Coast SPA / Ramsar due to the fact that some pipeline construction / decommissioning work will occur within the Tees Bay, and the fact that the main construction site lies immediately adjacent to Coatham Dunes / Sands.

Atmospheric pollution

4.2.10 The main pollutants of concern for European sites are oxides of nitrogen (NOx), ammonia (NH_3) and sulphur dioxide (SO_2) and are summarised in Table 15E-1. Ammonia can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges (CEH, 2016a). NOx can also be toxic at very high concentrations (far above the annual average Critical Level). However, in particular, high levels of NOx and NH_3 are likely to increase the total nitrogen deposition to soils, potentially leading to deleterious effects in resident ecosystems. For example, an increase in the total nitrogen deposition from the atmosphere is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on the community composition and quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats (Wolseley et al, 2006; Dijk, 2011). The total nitrogen deposition resulting from a plan or project is therefore often assessed as the overarching parameter determining atmospheric pollution.

4.2.11 The only pollutant likely to be associated with construction or decommissioning of the Proposed Development is NOx, which will be primarily determined by the associated traffic movements (relating to both on-site construction traffic and commuter traffic) and any diesel plant required for construction or decommissioning.

Table 4.1: Main sources and effects of air pollutants on habitats and species (CEH, 2016b)

Pollutant	Source	Effects on habitats and species
Ammonia (NH_3)	Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilization of animal wastes. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock. Ammonia reacts with acid pollutants such as the products of SO_2 and NO_X emissions to produce fine ammonium (NH_4+) - containing aerosol. Due to its significantly longer lifetime, NH_4+ may be transferred much longer distances (and can therefore be a significant trans-boundary issue). While ammonia deposition may be estimated from its atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.	The negative effect of NH_4+ may occur via direct toxicity, when uptake exceeds detoxification capacity and via N accumulation. Its main adverse effect is eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen. As emissions mostly occur at ground level in the rural environment and NH_3 is rapidly deposited, some of the most acute problems of NH_3 deposition are for small relict nature reserves located in intensive agricultural landscapes.
Nitrogen oxides (NO_x)	Nitrogen oxides are mostly produced in combustion processes. Half of NO_X emissions in the UK derive from motor vehicles, one quarter from power stations and the rest from other industrial and domestic combustion processes. In contrast to the steep decline in Sulphur dioxide emissions, nitrogen oxides are falling slowly due to control strategies being offset by increasing numbers of vehicles.	Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g. roadside verges). A critical level of NOx for all vegetation types has been set to 30 ug/m3. Deposition of nitrogen compounds (nitrates (NO_3), nitrogen dioxide (NO_2) and nitric acid (HNO_3)) contributes to the total nitrogen deposition and may lead to both soil and freshwater acidification. In addition, NO_x contributes to the eutrophication of soils and water, altering the species composition of plant communities at the expense of sensitive species.
Nitrogen deposition	The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g. NO_X) or reduced (e.g. NH_3) nitrogen emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices. The N pollutants together are a large contributor to acidification (see above).	All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally. Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species. N deposition can also increase the risk of damage from abiotic factors, e.g. drought and frost.

4.2.12 The Air Pollution Information System (APIS) forms the major source of information regarding the air quality impact pathway. It specifies a NOx concentration (Critical Level) for the protection of vegetation of 30 μgm^{-3}. In addition, ecological studies have determined 'Critical Loads' for atmospheric nitrogen deposition (that is, NOx combined with ammonia NH_3).

4.2.13 The Teesmouth and Cleveland Coast SPA / Ramsar is partly designated for breeding little tern, which make their simple nests ('scrapes') in various habitats, such as shingle and dunes. One of their requirements for breeding success is an absent or short sward, so they can form their nests. APIS identifies that terns are sensitive to the broad impacts from NOx, as excessive input might result in the increase of tall grasses and soil acidification, preventing the ability of terns to breed successfully.

4.2.14 The APIS website has a Site Relevant Critical Load Function tool which enables the sensitivity of each interest feature of each European site to be examined. Scrutiny of that tool for Teesmouth and Cleveland Coast SPA / Ramsar site identifies that the only species for which APIS suggests adverse effects may occur due to elevated NOx or nitrogen deposition is the nesting terns, for the reasons given above.

4.2.15 According to the Department of Transport's Guidance, beyond 200m, the contribution of vehicle emissions from the roadside to local pollution levels is not significant (**Figure 4.1~~Figure 4.1~~**). This is therefore the distance that has been used throughout this HRA to determine whether the Teesmouth and Cleveland Coast SPA / Ramsar is likely to be significantly affected by site traffic associated with the Proposed Development.

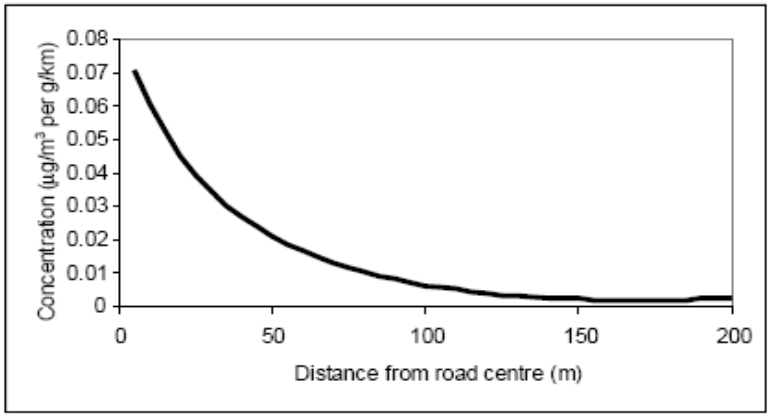

Figure 4.1: Traffic contribution to concentrations of pollutants at different distances from a road (Department for Transport, 2016)

4.2.16 An assessment of the traffic likely to be associated with the project has been conducted. The greatest number of vehicle movements will occur in the construction / decommissioning phase of the development. It is anticipated that based on other CCGT power stations, this will be up to 1,580 two-way vehicle movements per day during the peak construction or decommissioning period for the PCC Site. A Transport Assessment (TA) has been undertaken to determine the effects of the construction phase on the transport network, which includes a description of current and future baseline conditions (including link and junction flows), calculations of the construction traffic flows and the likely routes to be taken by site traffic and abnormal traffic loads (Chapter 16: Traffic and Transportation, ES Volume I, Document Ref. 6.2).

4.2.17 An Air Quality Impact Assessment (AQIA) has been carried out in Appendix 8A [**APP-247**] of the Environmental Statement which assessed the effects of vehicular traffic associated with the site (e.g. construction or decommissioning vehicles and machinery and operational vehicles) on roadside air quality (namely within 200m of major transport links into and within the site). This has been undertaken in accordance with Defra's Local Air Quality Management Technical Guidance (2009) and using the Highways Agency's Design Manual for Roads and Bridges (DMRB) screening model.

4.2.18 Of relevance to this HRA, review of the Affected Road Network (ARN) for the Proposed Development indicates that much of the traffic linking to the site will concentrate on the A1042 and the Trunk Road around Dormanstown, south-east of the Teesmouth and Cleveland Coast SPA / Ramsar. A component part of the SPA / Ramsar (Coatham Marsh) lies adjacent to the ARN, but APIS does not identify the designated species that will be using this part of the European site (i.e. the overwintering birds) as sensitive to nitrogen deposition or NOx effects on their broad habitat. There are also no known historic tern nesting sites within 200m of the ARN. The closest little tern nesting site (dating from 20 years ago) is situated approx. 1km to the east of the Proposed Development. Other tern nesting locations are considerably further away in Seaton (Snook, Sands, Carew) or Saltholme reserve. Given this evidence, it is concluded that construction / decommissioning traffic arising from the Proposed Development will not result in Likely Significant Effects on the nesting terns through NOx and nitrogen deposition. Therefore, atmospheric pollution in the Teesmouth and Cleveland Coast SPA / Ramsar due to construction / decommissioning traffic is screened out from Appropriate Assessment as it will not affect the ability of the site to achieve its Conservation Objectives for these species.

4.2.19 In addition to nesting terns, the SPA is designated for nesting avocet. APIS identifies that this species is sensitive to nitrogen deposition on its nesting habitat. However, the habitat associated with this species on APIS is littoral sediment, which has a relatively high nitrogen tolerance (a minimum critical load of 20 kg N/ha/yr). Total nitrogen deposition at the closest part of the SPA to the ARN is forecast to remain below this Critical Load even with the Proposed Development (being a maximum of c.11 kg N/ha/yr).

4.2.20 The construction / decommissioning phase may also result in emissions of NOx (leading to nitrogen deposition) from other sources, such as the use of diesel plant. Due to the phased nature of the construction or decommissioning works, site plant and Non-Road Mechanized Machinery (NRMM) will only be required to be operational at that nearest location for a limited duration over the overall construction / decommissioning period, and only operational on an 'as and when required' basis during that particular phase. Due to the limited number of site plant and NRMM anticipated to be in use on the works section of the site closest to the SPA / Ramsar, the limited number and intermittent hours of operation, and the setback distance that will generally be in place between them and the SPA / Ramsar, it is considered that any temporary short-term impact experienced on the SPA / Ramsar as a result of site plant and NRMM emissions is likely to be negligible and not significant. As such construction/decommissioning period atmospheric pollution to the Teesmouth and Cleveland Coast SPA / Ramsar due to NRMM is screened out of Appropriate Assessment as it will not interfere with the ability of the site to achieve its Conservation Objectives.

4.2.21 **In summary, atmospheric pollution during construction/ decommissioning is screened out of the HRA and does not require Appropriate Assessment due to the fact that most of the interest features of the Teesmouth & Cleveland Coast SPA / Ramsar (except for nesting tern and avocet) are not sensitive to the relevant**

pollutants, the roads affected by construction / decommissioning traffic do not lie close enough to European sites to affect the interest features and the NRMM will not materially affect pollution exposure.

Water quality

4.2.22 The quality of the water that feeds European sites is an important determinant of the nature of their habitats and the species they support, and therefore integral to meeting a site's Conservation Objectives. Poor water quality can have a range of environmental impacts. At high concentrations, toxic chemicals and heavy metals can result in the immediate death of aquatic life (both flora and fauna). At lower concentrations, negative impacts may be more subtle and could increase vulnerability to disease or change the behaviour of wildlife. These substances, especially Polychlorinated Biphenyls (PCBs), accumulate in minuscule benthic organisms and then biomagnify as they are passed up the food chain. Furthermore, they are not easily biodegraded over time. Overall, there are two broad types of toxic compounds in aquatic environments, namely synthetic and non-synthetic (i.e. naturally occurring) substances.

4.2.23 Toxic contamination may arise from synthetic toxic compounds, such as pesticides, PCBs (polychlorinated biphenyls) and biocides. Some of these substances are endocrine disrupting chemicals, which have the capacity to mimic animal hormones, prevent their production or breakdown. As discussed above, many of the synthetic compounds tend to accumulate over time and are likely to be present in animal tissue or substrate for long periods of time. Another factor in determining the magnitude of water pollution is the amount of hydrological mixing and tidal flushing that a site receives.

4.2.24 Non-synthetic compounds, such as fuel oils and heavy metals, occur in the environment naturally at relatively low concentrations, but become toxic at higher concentrations. Oil pollution is particularly damaging (and persistent) in intertidal environments, where natural degradation and weathering of oils is slow. Aside from their significant contribution to nutrient levels, Wastewater Treatment Works (WwTWs) are also major contributors of heavy metals, such as zinc, lead, copper and nickel. Heavy metal pollution might change the benthic assemblages in intertidal habitats. For example, it was demonstrated that a high concentration of heavy metals resulted in less diverse communities with lower overall abundances of crustaceans and polychaetes (Stark, 1998).

4.2.25 The Teesmouth and Cleveland Coast SPA / Ramsar is designated for its breeding tern and avocet and overwintering waterfowl. While aquatic pollutants may have direct effects on SPA / Ramsar birds, it is the indirect effects of synthetic and non-synthetic compounds on their supporting habitats and prey species that are of greatest concern. Natural England's SIP for the SPA / Ramsar indicates that past improvements to wastewater treatment and catchment management have significantly reduced the input of nutrients and contaminants into the Tees (Natural England, 2014b). However, the SIP still identifies water pollution as a concern for the

SPA / Ramsar, because contaminants from historic pollution events are stored in the sediments, potentially still affecting the benthic fauna.

4.2.26 To establish the ecological baseline communities, a Phase 1 study and macrofaunal sampling was undertaken in sites relevant to the Proposed Development. These included Coatham Sands and Bran Sands, which are intertidal muddy sandflats to the north of the Proposed Development. The results show that Bran Sands supports relatively complex and diverse benthic communities, including species such as common cockle *Cerastoderma edule* and lugworm *Arenicola marina*. While none of the species of the infaunal community are qualifying features of the SPA / Ramsar, they are likely to be integral food sources for qualifying waders, including redshank and knot. These species forage on a range of species, such as molluscs and crustaceans. By affecting the prevailing water quality, the Proposed Development might reduce the abundance and diversity of benthic invertebrates, which could have a knock-on effect on the qualifying bird species. This is particularly important because, despite the industrialised nature of the surrounding area, chemical sediment analysis has shown no evidence of high contaminant levels that might affect benthic habitat and / or species.

4.2.27 It is considered that the potential for toxic contamination of European sites during the construction / decommissioning phases is an issue that requires further consideration, particularly regarding the pools of the SPA / Ramsar adjoining the PCC site. Given the short distance involved, there is potential for toxic runoff and leachate reaching sensitive ecological receptors. **This impact pathway is screened in for Appropriate Assessment regarding the Teesmouth and Cleveland Coast SPA / Ramsar as it could affect the ability of the site to achieve its Conservation Objectives by impacting the supporting processes on which the qualifying features of the SPA/Ramsar rely.**

4.2.28 During the construction / decommissioning phase of the Proposed Development, non-toxic wastewater will be primarily produced by toilets for construction / decommissioning staff. This will be treated on-site using package plant with effluent disposed off-site (i.e. not discharged into local watercourses). Therefore, it is concluded that organic pollution from sewage effluent is not an issue for the construction or decommissioning period. Construction / decommissioning period treated wastewater impacts on the Teesmouth and Cleveland Coast SPA / Ramsar are therefore screened out from Appropriate Assessment as there is no mechanism for it to affect the Conservation Objectives of the site.

4.2.29 **In summary, the Proposed Development is screened in for Appropriate Assessment due to potential water quality impacts during construction / decommissioning as a result of oil, fuel and chemical spillages resulting in toxic surface run-off and leachate into the Teesmouth and Cleveland Coast SPA / Ramsar.**

Direct habitat loss

4.2.30 Both the transport pipeline that will deliver the compressed CO_2 to the offshore storage site and the potential replacement outfall will traverse the dune system and

the intertidal habitats of the Teesmouth and Cleveland Coast SPA / Ramsar. However, this will be undertaken using Horizontal Directional Drilling (HDD) or construction of a micro-bored tunnel respectively, meaning that no habitat loss within the SPA/Ramsar site will occur. The launch / exit point for the HDD / micro bore will be within the site compound and for the purposes of noise modelling (see later) has been assumed to be adjacent to the SPA boundary. In their Deadline 2 written representation (published 14/06/22) a concern was raised by Natural England regarding risk of collapse of the HDD bore and associated release of water-based drilling mud. Therefore, a LSE is identified and taken forward to Appropriate Assessment.

4.2.31 The CO_2 Gathering Network Pipeline will cross the River Tees in the existing Sembcorp No.2 Tunnel. As such there is no need for HDD or any other new construction through the River Tees in order to install this aspect of the Proposed Development.

4.2.32 **In summary, the Proposed Development is screened out of the HRA and does not need Appropriate Assessment due to the fact there will be no habitat loss within the Teesmouth and Cleveland Coast SPA / Ramsar site, with the exception of the potential for HDD collapse. As such construction / decommissioning of the scheme will not interfere with the Conservation Objectives of the site but potential for HDD collapse is taken forward to Appropriate Assessment.**

Disturbance in functionally linked habitat

4.2.33 Within the wider area of the Proposed Development there are four SACs designated for mobile species, including the Berwickshire and North Northumberland Coast SAC (approx. 87km to the north; designated partly for grey seal), the Humber Estuary SAC (approx. 110km to the south-east; designated partly for grey seal), The Wash and North Norfolk Coast SAC (approx.174 km to the south-east; designated partly for harbour seal) and the Southern North Sea SAC (approx. 102km to the east; designated partly for harbour porpoise). All these qualifying marine mammal species are mobile and might travel far beyond the designated site boundaries. Therefore, it cannot be excluded that the Proposed Development (or the area immediately surrounding it) might perform a role in supporting these qualifying species.

4.2.34 To support the DCO Application, AECOM undertook a marine mammal baseline characterisation study. The rationale behind this was to provide an evidence base establishing the importance (or otherwise) of the wider area around the Proposed Development for marine mammals that are qualifying species of the above-named SACs (please see Appendix 14C Marine Mammals [**APP-319**] of the Environmental Statement for the full baseline report).

4.2.35 Although the Zone of Influence (ZoI) of the Proposed Development is unlikely to extend beyond a few kilometres from the site boundary, the marine mammals found in the wider area are all wide-ranging species that form part of meta-populations. The highly transient nature of marine mammals must therefore be considered in more detail. The importance of the ZoI around the Proposed Development was

assessed using a data set on Small Cetacean in European Atlantic waters and the North Seas (SCANS).

4.2.36 The North Sea grey seal colonies have increased rapidly up to 2016. Within the Northeast England Seal Management Unit, grey seal counts have also increased between 2008 and 2017. There are no reported breeding sites in the Teesmouth area, although the seals do use the wider marine area for foraging and use a haul-out site at Seal Sands. However, given the amount of habitat available for the wider North Sea population, the area around the Proposed Development plays a very small part in the provision of overall habitat for this species. Furthermore, tagging and observational studies have shown little interaction and therefore movement between the different grey seal SAC populations. This makes it very unlikely that a significant number of individuals of the SAC populations are critically dependent on functionally linked habitat around the Proposed Development. Therefore, LSEs on the grey seal populations of Berwickshire and North Northumberland Coast SAC and Humber Estuary SAC can be screened out from Appropriate Assessment as the Conservation Objectives of the sites would not be affected.

4.2.37 As highlighted in Appendix 14C [**APP-319**] of the Environmental Statement, the maximum number of harbour seal in the area around the Proposed Development has increased steadily since 2008. Seal Sands, opposite the Proposed Development on the western side of the River Tees, supports a breeding colony of harbour seal. Furthermore, the species is likely to use the wider marine area for foraging. However, given the amount of habitat available for the wider North Sea population, the area around the Proposed Development plays a very small part in the provision of overall habitat for this species, making it very unlikely that a significant number of individuals of the SAC populations is critically dependent on functionally linked habitat around the Proposed Development. Therefore, LSEs on harbour seal population that breeds within The Wash & North Norfolk Coast SAC can be screened out from Appropriate Assessment as the Conservation Objectives of the site would not be affected.

4.2.38 JNCC's Advice Note setting out the Management Units for cetaceans in UK waters, highlights that both the Southern North Sea SAC and the Proposed Development lie within the North Sea Management Unit for harbour porpoise (JNCC, 2015a). Harbour porpoise are present along the northeast coast of England all year and an assessment of the SCANS data highlights that the North Sea population has remained stable since the mid-1990's. Count block O of the SCANS data shows that the area around the Proposed Development has one of the highest densities of harbour porpoise (1.31 animals/km^2) in the North Sea Management Unit. This species is considered to be threatened and declining in the Greater North Sea by the OSPAR commission, but in the UK is classified as having favourable conservation status by the JNCC. Overall, it is considered that the Proposed Development might affect the Southern North Sea SAC, depending on the number of harbour porpoise impacted and the extent to which they might be affected. Baseline information presented in Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2) and in Appendix 14C: Marine Mammal Baseline (ES Volume III, Document Ref. 6.4) suggests that

harbour porpoise can be expected to occur from time to time within the Tees Bay but are unlikely to venture into the estuary.

4.2.39 Anthropogenic noise (such as from impulsive construction / decommissioning works) can reduce the ability of marine mammals to echolocate and communicate, and it may also result in behavioural changes and physical injury. Marine mammal species are categorised into different hearing groups on the basis of their hearing sensitivities. Harbour porpoise, the only qualifying species identified above requiring further consideration, is a high-frequency cetacean[6]. Effects of anthropogenic noise may primarily manifest as impacts on hearing, such as permanent threshold shifts (PTS) and temporary threshold shifts (TTS).

4.2.40 Harbour porpoise are sensitive to noise disturbance arising from development construction / decommissioning, especially the high sound pressure levels generated by pile driving construction for offshore windfarms (Brandt, 2011). The construction of smaller coastal developments may also affect harbour porpoise but is less well explored. Notwithstanding this, monitoring in Scotland has shown that such development may result in the local displacement of harbour porpoise. Scientific papers in the peer-reviewed literature have shown that acoustic disturbance resulting from development projects can result in the long-term impairment of the hearing system and local displacement of harbour porpoise (JNCC, 2015b).

4.2.41 Several construction / decommissioning activities associated with the Proposed Development will take place in the marine environment and have the potential to change the soundscape experienced by harbour porpoise, including geophysical survey, dredging and discharge points and any associated movements of marine vessels. To assess the potential effect of the most impactful element of the construction / decommissioning works to be undertaken in water, data for underwater sound modelling were compared to the sensitivity thresholds for harbour porpoise (for full details see Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2). The results of the simplified underwater sound modelling predict relatively small impact distances of sonar sound sources related to construction and decommissioning, although for high-frequency cetaceans such as harbour porpoise, the potential impact zone is estimated to extend up to 5.7km from the sound source for TTS and 3km for PTS. While behavioural thresholds for marine mammals are not well established, it is generally accepted that any noise impact with a transient effect on hearing (i.e. resulting in TTS) will have behavioural impacts[7].

[6] Southall B. L., Bowles A. E., Ellison W. T., Finneran J. J., Gentry R. J., Greene Jr C. R., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., Richardson J.W., Thomas J.A, and Tyack P.L. 2007. Marine mammal noise exposure criteria: initial scientific recommendations. Aquatic Mammals. 33. 411 – 522.

[7] ibid

4.2.42 The Proposed Development might also involve other impulsive sound sources, such as a requirement of Unexploded Ordnance (UXO) detonations of (prior to the DCO Application) unknown location and number (also see Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2). Given that the area around the Proposed Development is considered functionally linked to the Southern North Sea SAC and the relatively far-reaching impact zones of UXO detonations (e.g. >10km for high-frequency cetaceans), it is concluded that such detonations – without appropriate mitigation measures in place – might lead to TTS in cetaceans including harbour porpoise.

4.2.43 **Given the area's functional linkage with the Southern North Sea SAC and the risk of unmitigated noise produced by marine construction / decommissioning works (and possibly UXO detonations), LSEs cannot be excluded, and the marine construction / decommissioning works are screened in for Appropriate Assessment as they could affect the Conservation Objectives of the SAC by affecting harbour porpoise population numbers.** At that point the standard JNCC mitigation for piling and geophysical surveys will be taken into consideration.

4.2.44 Since the CO_2 Gathering Network Pipeline will cross the River Tees in the existing Sembcorp No.2 Tunnel there is no need for HDD or any other new construction through the River Tees in order to install this aspect of the Proposed Development and therefore no potential for underwater noise impacts.

4.2.45 Two sites to the north of the Proposed Development are designated for migratory fish; the River Tweed SAC (approx. 138km to the north-west) and the Tweed Estuary SAC (approx. 137km to the north-west). The River Tweed SAC is designated for Atlantic salmon and sea lamprey, while the Tweed Estuary SAC is designated for sea lamprey only. The aforementioned Humber Estuary SAC is also designated partly for sea lamprey. These species are anadromous (i.e. spawn upstream in rivers) and complete their life cycle in the sea. Atlantic salmon in particular are known to undertake long migratory journeys in the sea during their adult life stage. Therefore, it was considered to what extent the Proposed Development could interfere with fish migration routes along the east coast of England. However, given that development will be restricted to the intertidal zone, and the dune system of the Teesmouth and Cleveland Coast SPA / Ramsar, it is concluded that there is no linking impact pathway to significantly interfere with the fish migration routes for these European sites. Therefore, the River Tweed SAC and the Tweed Estuary SAC (and fish populations of the Humber Estuary SAC) are screened out from Appropriate Assessment as their Conservation Objectives will not be affected.

4.2.46 **In summary, the Proposed Development is screened in for Appropriate Assessment with regard to potential for disturbance of harbour porpoise associated with the Southern North Sea SAC as a result of construction / decommissioning activities and potential UXO detonations required in the construction phase.**

Effects on foraging resources of SPA / Ramsar birds

4.2.47 The Teesmouth and Cleveland Coast SPA / Ramsar is designated for breeding and overwintering birds that forage on invertebrates (the wading bird species) and small fish (the tern species). Some of the elements of the proposed works will temporarily (or in the case of the rock armour for the new outfall head for either the existing or replacement outfall, permanently) alter the marine habitats in the area surrounding the Proposed Development. This includes potential dredging (removal of sediment) around the water discharge, which lies in Tees Bay approximately 1km below MLWS. However, the dredging activities are unlikely to result in temporary changes to the abundance and spatial distribution of the foraging resources of the qualifying bird species.

4.2.48 Subtidal habitats and their associated infaunal and epifaunal communities will be directly impacted as a result of dredging for the outfall head approximately 1km off-shore. However, soft sediments, which characterise much of the marine habitats, are highly resilient to direct physical disturbance arising from substrate loss. The spatial extent of the construction / decommissioning works in the marine environment would be comparatively small and it is expected that both habitats and their associated species would recover within 5 years. The temporary impact on benthic habitat, while significant locally to the outfall head, would not be expected to be significant in the context of the wider availability of this habitat in the area. Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2), states that the footprint of the marine construction / decommissioning works on benthic habitats and communities is predicted to be not significant. Overall, therefore, temporary impacts on foraging resources of SPA / Ramsar birds in the construction / decommissioning phases is screened out from Appropriate Assessment.

4.2.49 The emplacement of the new outfall head and the installation of the associated rock armouring / scour protection would result in permanent loss of subtidal sandflat. The total area of subtidal sandflat lost due to the replacement outfall head and associated rock armour is calculated to be approximately 100m^2. Loss of subtidal sandflat could result in changes in the habitat of species on which the birds of the Teesmouth and Cleveland Coast SPA / Ramsar site feed, which could have effects on prey biomass. Placement of rock armour could also affect coastal processes local to the outfall which could further impact the habitat of prey species for SPA / Ramsar birds. The introduction of hard artificial substrates in areas otherwise characterised by sandy mobile substrates has the potential to facilitate the establishment and spread of invasive non-native species. **LSEs cannot therefore be dismissed and this is discussed further in the Appropriate Assessment.**

4.2.50 Fish, the foraging resource for the terns, could also be affected by the temporary impact and physical disturbance in habitats affected by the marine construction / decommissioning works. While adult fish are able to move away from stressors and are considered less vulnerable to marine works, less mobile benthic life stages (e.g. eggs and larvae) are unable, or less able, to do so. However, the area affected by the marine construction / decommissioning works is a geographically small part of the overall open water available for foraging by terns. Furthermore, recovery of fish

species populations and linked habitats would also be expected on cessation of works.

4.2.51 **The temporary effects of marine construction / decommissioning works on the foraging resources of qualifying birds for the Teesmouth and Cleveland Coast SPA / Ramsar is therefore screened out from Appropriate Assessment as it would not affect the Conservation Objectives of the SPA. However, the permanent effects of rock armour placement around the outfall head are screened in for further discussion in the Appropriate Assessment.**

4.3 Operational Period

Visual and noise disturbance

4.3.1 Once complete, the Proposed Development will be operational 24 hours a day. An assessment of the potential for visual and noise disturbance during the operational period was therefore undertaken. It is considered that activity on the PCC Site, the component of the Proposed Development that is closest to the Teesmouth and Cleveland Coast SPA / Ramsar, would not result in visual disturbance of qualifying birds in this SPA / Ramsar because the site of the Proposed Development has a long history of industrial use and the overwintering birds in this SPA / Ramsar have traditionally been used to activity from site staff even though numbers of people in the area have been low in recent years. Overall, visual disturbance of Teesmouth and Cleveland Coast SPA / Ramsar during operation is screened out from Appropriate Assessment due to habituation which will not interfere with the ability of the SPA to achieve its Conservation Objectives.

4.3.2 An assessment of the potential for noise disturbance to qualifying bird species of the Teesmouth and Cleveland Coast SPA / Ramsar during the operational period was also undertaken, particularly because the PCC Site (containing the CCGT and CO_2 capture plant) lies directly adjacent to the dune system of this SPA / Ramsar.

4.3.3 Noise modelling predicts that the operation of the Proposed Development will result in a maximum noise level of 50-55 dB LAeq in the dune system of the Teesmouth and Cleveland Coast SPA / Ramsar (Figure 11-5 Rev 3 of the ES Addendum Vol II, Document Ref 7.8.2) while the pools used by wintering redshank will experience noise levels of below 60dB. This is in line with the existing daytime (56 dB LAeq) and night-time (47 dB LAeq) noise levels measured at location E1. Furthermore, it is considerably lower than the acceptable regular noise threshold of 70 dB (at receptor birds), which was identified in research undertaken for congregations of similar birds in the Humber Estuary[8]. Therefore, it is concluded that the operational phase of the Proposed Development would not result in LSEs on the Teesmouth and Cleveland Coast SPA / Ramsar regarding operational noise disturbance due to the relatively low

[8] Cutts, N., Phelps, A. and Burdon, D. 2009. Construction and waterfowl: Defining Sensitivity, Response, Impacts and Guidance. Report to Humber INCA, Institute of Estuarine and Coastal Studies, University of Hull

noise levels caused by the operational plant. This impact pathway is screened out from Appropriate Assessment as the ability of the SPA to achieve its Conservation Objectives will not be affected.

4.3.4 **In summary, LSEs on the Teesmouth and Cleveland Coast SPA / Ramsar due to operational disturbance are screened out due to a combination of habituation and the relatively low noise levels at the SPA / Ramsar caused by the operational plant.**

Atmospheric pollution

4.3.5 The largest portion of atmospheric pollutants arising from the Proposed Development during the operational phase will derive from the operational Power and Capture plant. The CCGT will generate electricity through the combustion of natural gas. The resulting combustion gases will contain NOx, which will be abated to some extent by the SCR abatement; however, this in itself will lead to an emission of ammonia.

4.3.6 An Atmospheric Impact Assessment (AIA) has been undertaken using detailed air dispersion modelling to determine the potential impact of the NOx and ammonia emissions from the operational power station. The modelled predicted impacts have been used to produce isopleth plots (contours) to enable an assessment of the process contributions and the predicted environmental concentrations of NOx and NH_3 and the deposition of nitrogen and other atmospheric pollutants, at specific distances from the plant. No sulphur dioxide will be emitted since the Proposed Development will be gas-fired.

4.3.7 It has already been discussed in the construction / decommissioning period section of this HRA report that the terns of the Teesmouth & Cleveland Coast SPA / Ramsar are the only species which are sensitive to the broad impacts from NOx and nitrogen deposition. The APIS Site Relevant Critical Load Function tool also identifies that:

- No species are identified as being adversely affected by acidification (which can result from nitrogen deposition); and that
- Since the SPA / Ramsar is designated for breeding tern and avocet and for passage / wintering waterfowl and waders, toxic effects of ammonia on vegetation are less ecologically important to the SPA / Ramsar site than its role in nitrogen deposition.

4.3.8 Although the number of CCGT and Carbon Capture units has reduced from three to one since the Preliminary Environmental Information Report (PEIR), nitrogen deposition resulting from the Proposed Development will still be above 1% of the Critical Load threshold for relevant Teesmouth and Cleveland Coast SPA / Ramsar habitats at the closest areas of the SPA / Ramsar site surrounding the plant. The 1% Critical Load limit is typically used by Natural England and the Environment Agency to denote potential significant atmospheric pollution impacts which require further analysis. **Therefore, LSEs on the SPA/Ramsar site cannot be dismissed and Appropriate Assessment is required.**

4.3.9 The North York Moors SAC is designated for blanket bogs (nitrogen Critical Load of 5-10 kg N/ha/yr) and two types of heathland communities (nitrogen Critical Load of 10-20 kg N/ha/yr). According to the Site Relevant Critical Load page on APIS for the SPA these are not only the reasons for SAC designation but also the key habitats on which the SPA species rely within the SPA boundary. As such these two sites are discussed together here despite having different interest features as the relevant habitats are identical. A review of habitat mapping in MAGIC indicates that the north-western section of the SAC comprises only heathland and the higher minimum Critical Load of 10 kg N/ha/yr applicable to heathland is therefore to be used and there will be no impact on bogs. With regard to the North York Moors SAC (and the overlapping North York Moors SPA) acid deposition due to the operational power and capture plant is not forecast to exceed the 1% of the Critical Load criterion for either the SPA habitats or SAC features. However, in the PEIR it was identified that operational stack emissions from the Proposed Development as it stood at the time (prior to improvements to the process technology) would result in 0.1-0.2 kg N/ha/yr nitrogen deposition. Using the higher deposition of 0.2 kg N/ha/yr and the minimum nitrogen Critical Load for the heathland habitat components (10 kg N/ha/yr), the Proposed Development as it stood at the time of the PEIR would contribute approx. 2% of the Critical Load for wet and dry heaths respectively. The nitrogen deposition doses for the heathland habitats using the emissions assumed at the time of the PEIR would exceed the '1% of the Critical Load' standard that is used to dismiss atmospheric pollution effects. **Overall, LSEs of stack emissions from the Power and Capture plant on the North York Moors SAC (and overlapping SPA) cannot be excluded due to the size of the forecast nitrogen dose and the potential for it to affect the species composition of an SAC habitat and thus its Conservation Objectives. As such, this impact pathway is screened in for Appropriate Assessment at which point the improvements to emissions process technology will be taken into account.**

4.3.10 Durham Coast SAC is not identified on APIS as being sensitive to nitrogen or acid deposition and no Critical Loads are available for this site on which to base any assessment. With regard to the Northumbria Coast SPA / Ramsar, nitrogen deposition due to the Proposed Development is not forecast to exceed 1% of the Critical Load at the closest part of the site (the interest features of the site are not sensitive to acid deposition according to APIS). Moreover, according to APIS the only interest features sensitive to nitrogen deposition are the nesting terns. These colonies are located at the mouth of the Long Nanny Burn in Beadnell Bay, much further north than the area affected by the Proposed Development. Since these sites are either not sensitive to nitrogen deposition or will be affected to a negligible degree, LSEs on the Durham Coast SAC and the Northumbria Coast SPA / Ramsar from air pollution can be screened out.

4.3.11 The operational phase of the Proposed Development will also be associated with site traffic (e.g. vehicles transporting staff or machinery within the site) and commuter traffic. However, Chapter 16: Traffic and Transport (ES Volume I, Document Ref. 6.2) identifies that the Proposed Development will have approx. 60 full-time staff working

in three shifts and around 40 corporate staff working on site during normal working hours (09:00-17:00). Assuming a conservative average car occupancy of 0.7 this equates to 70 cars driving to the Proposed Development per day and a total of 140 2-way vehicle movements. Furthermore, to deliver operational and maintenance plant, 4 Heavy Duty Vehicles (HDVs) will be on site per day. The traffic flow generated during the operational phase of the Proposed Development is well below the threshold for defining an 'Affected Road' in Highways England parlance[9] and is therefore considered to have a negligible effect on air quality. Pollution from operational vehicle movements is therefore screened out from Appropriate Assessment.

4.3.12 **In summary, the Proposed Development is screened in for Appropriate Assessment regarding operational atmospheric pollution due to the forecast nitrogen dose at the closest part of Teesmouth & Cleveland Coast SPA / Ramsar and North York Moors SAC / SPA.**

Water quality

4.3.13 In the absence of mitigation, similar water quality issues are likely to be relevant for the Proposed Development in the operational phase as apply in the construction / decommissioning phase. This includes potentially toxic surface run-off and leachate from machinery and plant involved in the day-to-day operation of the power plant, and non-toxic pollution from sewage effluent. Unmitigated, these pollutants may enter the Teesmouth and Cleveland Coast SPA / Ramsar directly or indirectly via groundwater / surface water in hydrological continuity with these European sites.

4.3.14 Regarding the issue of potentially toxic pollution during the operational phase, ~~the same evidence base applies that was relevant in the construction / decommissioning period.~~ modelling undertaken for the Water Framework Directive assessment explored those chemical contaminants with discharge concentrations above the Environmental Quality Standards (EQS), namely chromium VI, copper and zinc. The modelling has identified that EQS concentrations for chemical contaminants are always met within a few metres of the outfall and before the plume meets the water surface. Therefore, this impact pathway is not discussed further here.

4.3.15 In contrast to the construction / decommissioning phase, once operational the Proposed Development would provide staff with toilets that are connected to the mains. It is anticipated that wastewater will discharge into the local sewerage system for treatment at Marske by the Sea WwTW. Therefore, the Proposed Development is likely to increase the volume of treated wastewater discharged into local waterbodies that are sensitive to changes in water quality. In March 2022, Natural England published advice to competent authorities regarding the effects of increased nutrients on a series of European sites around England. For these identified European

[9] Defined as a change of 1,000 two-way AADT (Annual Average Daily Traffic)

sites, Natural England's advice was that their ability to achieve their conservation objectives was compromised by existing nutrient inputs from agricultural and treated effluent sources. In their March 2022 letter, Natural England identified Teesmouth & Cleveland Coast SPA as one of the European sites suffering from excess nutrient inputs. ~~Typically, wastewater effluent is considered not to negatively impact European sites if it can be accommodated within the consented headroom of WwTWs, which is regulated by the Environment Agency's Review of Consents process. This is because the headroom is apportioned considering the qualifying features of the relevant European sites, ensuring that there are no adverse effects.~~ ~~**Nonetheless, this**~~This **impact pathway is therefore screened in for Appropriate Assessment with regard to increased nitrogen inputs ~~as a precautionary measure~~.**

4.3.16 The CCGT unit will be cooled with water abstracted from the River Tees as a worst-case scenario. In the cooling process the water will warm up and will then be returned to the Tees Bay via a long outfall pipe. The discharge of heated cooling water and water used in the steam cycle also has potential impacts on water quality. The predominant source of chemical contaminants would be from the direct contact cooler blowdown, comprising water with elevated dissolved CO_2 and ammonia concentrations (also see Chapter 9: Surface Water, Flood Risk and Water Resources, ES Volume I, Document Ref. 6.2). Generally, the overall predicted chemical effluent rate is likely to be low and the coastline's open hydrodynamic conditions facilitate rapid dispersion. Mitigation approaches such as biological treatment and retention ponds, while identified, cannot be taken into account at the LSEs stage. **Therefore, as a precautionary measure, potential negative effects on water chemistry through discharged cooling water are screened in for Appropriate Assessment.**

4.3.17 The discharge of cooling water is likely to also affect other abiotic parameters, such as water temperature and turbidity (the latter mediated through the erosion of sediment around the outfall pipe). However, this impact pathway will be assessed in the section on heated cooling water discharge below.

4.3.18 **In summary, the Proposed Development in the operational period is screened in for Appropriate Assessment regarding the Teesmouth and Cleveland Coast SPA / Ramsar, pending further design information. This is due to the following impact pathways that could affect the Conservation Objectives of the SPA through affecting the supporting processes of the SPA:**

- **Water quality impacts as a result of oil, fuel and chemical spillages resulting in toxic surface run-off and leachate;**
- **Water quality impacts as a result of discharged cooling water; and**
- **Wastewater effluent from domestic water usage within the site.**

Physical effects of d~~D~~ischarge of heated cooling water

4.3.19 As highlighted in an earlier section of this HRA, most of the site's water requirement stems from the cooling duty for the CCGT and its associated infrastructure. The worst-case scenario specifies that cooling water will be returned to the Tees Bay via

the existing steelworks outfall or a replacement. One potential risk associated with the outflow of water into the Tees Bay, would be potential wash-out and erosion of the intertidal mudflat habitats. This could lead to knock-on effects in the Teesmouth and Cleveland Coast SPA / Ramsar, such as accompanying increases in turbidity and water temperature. However, the outfall for the discharge will be 1km off-shore in Tees Bay, well beyond the intertidal zone. Moreover, assessments for the Environmental Statement indicate that the volume of cooling water to be used in the Proposed Development will be relatively low and the volume and velocity of water returned to the marine environment will also be low such that erosion will not arise. Finally, near-field thermal plume modelling has been undertaken for the Environmental Statement to trace the likely extent of thermal discharge at the proposed outfall location. This confirms that the likely extent of a thermal plume (of the properties modelled) would be localised and would thus be very unlikely to influence fish and invertebrate prey numbers relating to the Teesmouth & Cleveland Coast SPA / Ramsar.

4.3.20 Chapter 14: Marine Ecology and Nature Conservation [**APP-096**] concludes that the subtidal habitats and communities in the area have a low sensitivity to temperature changes and any effects on community composition are expected to be highly localised, being restricted on the immediate vicinity of the outfall head.

4.3.21 It is therefore concluded that impacts on European sites due to the return of cooling water at the outfall location will not result in LSEs and can be screened out of Appropriate Assessment.

4.3.22 **In summary, the Proposed Development is screened out of Appropriate Assessment regarding the Teesmouth and Cleveland Coast SPA / Ramsar because the volume of cooling water to be used in the Proposed Development will be low, the volume and velocity of water returned to the marine environment will also be low and the thermal plume associated with release of water will be very localised.**

Coastal squeeze

4.3.23 Coastal squeeze is a term that originates from coastal management, whereby intertidal habitats used by SPA / Ramsar birds are lost as the sea level rises and inland brownfield development (e.g. a sea wall or an industrial complex) prevents the inland migration of habitats (e.g. saltmarsh) and its associated species. A good background summary on this impact pathway can be found in Doody (2013). As a result, the habitat is 'squeezed' and reduces in size. This is a significant process, particularly in geographic areas that are highly urbanised or that are rapidly transitioning from an undeveloped to developed state.

4.3.24 While the project proposes the construction / decommissioning of a CCGT, carbon capture plant and associated infrastructure, thereby undoubtedly contributing brownfield development in a coastal landscape, the PCC Site (which will be the main above-ground development) will be constructed on an existing brownfield site, the former Redcar steel works. As such, the project will not result in any loss of greenfield land adjacent to the coast. Overall, it is considered that LSEs can be excluded, and

coastal squeeze as a result of the Proposed Development is screened out from Appropriate Assessment as it will not arise.

4.3.25 **In summary, coastal squeeze will not arise and is therefore not taken forward to Appropriate Assessment.**

5.0 SUMMARY OF LIKELY SIGNIFICANT EFFECTS TEST

5.1 Introduction

5.1.1 This section provides a brief summary of the European sites and impact pathways that were screened out or taken forward to the Appropriate Assessment stage. The summary is shown by European site and impact pathway, with construction (C), operational (O) and decommissioning (D) period clearly marked.

5.2 Impact Pathways Screened Out

5.2.1 The following impact pathways associated with the Proposed Development were screened out from Appropriate Assessment, because the best objective available evidence indicated that no LSEs would arise:

Teesmouth and Cleveland Coast SPA / Ramsar

- Visual and noise disturbance (O)
- Atmospheric pollution (C and D)
- Physical effects of d~~D~~ischarge of heated cooling water (O)
- Coastal squeeze (O)

Durham Coast SAC

- Atmospheric pollution (O)

Northumbria Coast SPA / Ramsar

- Atmospheric pollution (O)

Berwickshire and North Northumberland Coast SAC

- Disturbance in functionally linked habitat (C and D)

Humber Estuary SAC

- Disturbance in functionally linked habitat (C and D)

The Wash and North Norfolk Coast SAC

- Disturbance in functionally linked habitat (C and D)

River Tweed SAC

- Disturbance in functionally linked habitat (C and D)

Tweed Estuary SAC

- Disturbance in functionally linked habitat (C and D)

5.3 Impact Pathways Screened in for Appropriate Assessment

5.3.1 The following impact pathways associated with the Proposed Development were screened in for Appropriate Assessment, because best available evidence indicated

that a potential for LSEs could not be excluded. They are therefore the subject of this report. For some this was simply due to the need for mitigation measures to be discussed. Consideration of the Rochdale Envelope also meant that the most impactful scenario needed to be applied.

Teesmouth and Cleveland Coast SPA / Ramsar

- Noise and visual disturbance (C and D)
- Effects on foraging resources due to rock armour (C and D)
- Atmospheric pollution (O)
- Water quality (C, D and O)
- Direct landtake due to HDD collapse (C)

North York Moors SAC

- Atmospheric pollution (O)

North York Moors SPA

- Atmospheric pollution (O)

Southern North Sea SAC

- Disturbance of harbour porpoise in functionally linked habitat (C)

6.0 APPROPRIATE ASSESSMENT

6.1 Teesmouth and Cleveland Coast SPA / Ramsar

Noise and Visual Disturbance (Construction and Decommissioning)

6.1.1 The LSEs assessment showed that noise disturbance impacts on the qualifying bird species in the Teesmouth and Cleveland Coast SPA / Ramsar during construction and decommissioning could not be excluded. This is particularly due to the proximity of the PCC site to the feeding, roosting and loafing pools in the dune systems of the SPA / Ramsar (specifically the area of revegetated slag and associated pools immediately north of the PCC Site) that support a population of non-breeding redshank.

6.1.2 Baseline sound levels were originally measured at four locations (E1 – E4) relevant to qualifying birds of the SPA / Ramsar. This showed relatively loud existing *LAFmax* baseline sound conditions. For example, location M3 (Tod Point Road, adjacent to the SPA / Ramsar pools) had a daytime baseline of up to 81 dB *LAFmax*. At location E1 (RSPB Saltholme), the same daytime baseline measurements were also up to 81 dB *LAFmax*. Therefore, it was considered that birds using these areas, are likely to have habituated to some degree of noise disturbance in their environment.

6.1.3 Noise modelling contours for the construction / decommissioning period for the PEIR highlighted that the *LAeq* arising from sheet piling would be likely to disturb the birds. However, the site boundary of the Proposed Development has since changed, sheet piling has been omitted and it has been confirmed that bored piling will be used at the PCC Site rather than driven piling, such that the PEIR modelling required updating.

6.1.4 For the Environmental Statement, further baseline noise levels at three key ecological Noise Sensitive Receptors (NSRs) were obtained. The following locations were selected for baseline noise monitoring and are shown on ES Figure 11-1 Rev 3.0 (ES Addendum Volume II, Document Ref. 7.8.2) which is included for reference in Appendix E of this HRA:

- Southern point in Bran Sands;
- Near the pools of the dune systems in the Teesside and Cleveland Coast SSSI;
- A1185 Road passing adjacent to Saltholme Reserve.

6.1.5 **Table 6.1~~Table 6.1~~** shows that all three locations have relatively low existing L_{Aeq} values (between 43 and 52, comparable with those recorded at receptor E1 and used in the LSEs assessment) but also relatively low L_{AFmax} values (51-67 dB) compared to receptor E1 due to their greater distance from the road. The Coatham Sands element of the SSSI, the part of the Teesmouth and Cleveland Coast SPA / Ramsar closest to the PCC Site), has an L_{AFmax} of 59dB, indicating it is relatively quiet.

Table 6.1: Baseline noise measurements at relevant locations in the Teesmouth and Cleveland Coast SPA / Ramsar

LOCATION	TIME PERIOD	$L_{Aeq, T}$ (dB)	L_{AFmax} (dB)
Coatham Sands	Day	46	59[10]
Coatham Sands	Evening	43	51
Coatham Sands	Night	43	54
Coatham Sands	Weekend	43	56
Bran Sands	Day	48	67
Bran Sands	Evening	46	63
Bran Sands	Night	44	57
Bran Sands	Weekend	46	67
Saltholme	Day	52	65

6.1.6 Notwithstanding the baseline noise measurements, Natural England have confirmed that they consider the 70 dB threshold (i.e. noise levels below 70 dB at the bird enable a conclusion of no adverse effect on integrity) to be an appropriate disturbance metric for this SPA / Ramsar, based on research undertaken in the Humber Estuary and the fact that the birds of Teesmouth & Cleveland Coast SPA / Ramsar have exhibited considerable tolerance to variations in noise level.

PCC Site

6.1.7 Construction period bored piling at the PCC Site will lead to a *LAeq* of approx. 65 - 70dB at the northern edge of the Proposed Development in the Coatham Dunes units of the Teesmouth and Cleveland Coast SSSI. Only a small section of the SPA / Ramsar would fall within this zone (approximately 5ha), the entire area falls below the 70 dB disturbance threshold identified by Natural England as being significant for the SPA / Ramsar, and the affected area excludes the pools protected for their bird (wintering redshank) interest. As a result, a conclusion of no adverse effect on integrity can be reached.

6.1.8 For decommissioning, it is likely that installed piles will be cut off below the surface rather than entirely removed.

[10] These L_{Amax} values for Coatham Sands are much lower than the values reported in the PEIR. That is because the monitoring location for Coatham Sands reported in that report (E1) was next to the road at the edge of the SPA where an L_{Amax} of 81 dB was recorded. In contrast the monitoring point reported in this table was further from the road and further into the SPA/Ramsar site.

CO_2 Export Pipeline

6.1.9 The construction works for the CO_2 export pipeline will involve Horizontal Direct Drilling (HDD) whilst the replacement outfall would involve construction of a micro-bored tunnel. Both would require launch pits (if drilled from on-shore to off-shore). As a worst case, the HDD launch pit is assumed to be near the northern boundary of the PCC Site and thus very close to the Teesmouth & Cleveland Coast SPA / Ramsar site.

6.1.10 Since there is no percussive element to the works (unlike with impact piling) only *LAeq* data are reported. Modelling for Environmental Statement Chapter 11: Noise and Vibration [**APP-093**] confirms that noise levels would be 69 dB (i.e. below 70 dB as agreed with Natural England) at 65m from the CO_2 export pipeline corridor.

Table 6.2: HDD with no Noise Barrier

Distance from edge of construction area (m)	Level $L_{Aeq,T}$ (dB)	Significance
65	69	Hull University Institute of Estuarine & Coastal Studies (IECS) Receptor Value
100	65	At pond 13
150	61	At pond 14
190	58	10 dB above Bran Sands measured daytime $L_{Aeq,T}$
270	55	10 dB above Coatham measured daytime $L_{Aeq,T}$
525	48	Equal to Bran Sands measured daytime $L_{Aeq,T}$
675	45	Equal to Coatham measured daytime $L_{Aeq,T}$ T

Table 6.3: HDD with full screening barrier

Distance from edge of construction area (m)	Level $L_{Aeq,T}$ (dB)	Significance
24	69	IECS Receptor Value
90	58	10 dB above Bran Sands measured daytime $L_{Aeq,T}$
100	57	At pond 13
130	55	10 dB above Coatham measured daytime $L_{Aeq,T}$
150	54	At pond 14
290	48	Equal to Bran Sands measured daytime $L_{Aeq,T}$
425	45	Equal to Coatham measured daytime $L_{Aeq,T}$

6.1.11 The nearest pool (significantly overgrown) is Pond 13, approximately 100m from the closest point of HDD. The nearest pond that is still open and available for use by redshank is Pond 14, 150m from the closest point of HDD. Moreover, the inclusion of a noise barrier would reduce noise levels to 69 dB just 24m from the nearest point of HDD such that by 100m from the works the noise level due to the HDD would be a relatively quiet 57 dB. At these distances (at least 100m) no visual disturbance of birds using the pools and intertidal zone is likely to arise from works on land and the noise barrier would also act as a visual screen to workers at ground level.

6.1.12 This section of the Proposed Development traverses part of the Teesmouth and Cleveland Coast SPA / Ramsar at Coatham Dunes and Sands but would be many metres below the surface with no open cut works. The only works within the dunes would be non-intrusive physical surveillance by an individual contractor.

6.1.13 Notwithstanding the fact that noise levels will be well below 70dB, in addition to the installation of a noise barrier, simultaneous vantage point bird monitoring will be undertaken if HDD is due to occur during November to March in order to confirm the absence of disturbance events (see Figure 11-4 of Chapter 11: Noise and Vibration (ES Volume II, Document Ref. 6.3 and appended here).

6.1.14 As a result, it can be concluded there will be no adverse effect on the integrity of the Teesmouth & Cleveland Coast SPA / Ramsar site through disturbance from the HDD for the CO_2 export pipeline.

CO_2 Gathering Network

6.1.15 The CO_2 gathering network corridor runs to the north of the Saltholme Reserve (part of the Teesmouth and Cleveland Coast SPA / Ramsar), past the southern end of the Seal Sands Industrial Estate, before crossing the River Tees and reaching the PCC Site. The pipeline will be attached to the existing pipe racks in that location, but pipe bending, stringing and welding will still be needed during the construction and decommissioning periods. These construction/decommissioning activities involve no impulsive sound elements and thus only L_{Aeq} is discussed. According to Figure 11-3 of Chapter 11: Noise and Vibration (ES Volume II, Document Ref. 6.3, appended here), L_{Aeq} is modelled to exceed 69dB within 50m of the construction/decommissioning activities for the CO_2 gathering network corridor. Therefore, relatively narrow bands of Saltholme Reservoir and the River Tees would be temporarily subjected to noise levels above the noise thresholds identified by IECS. However, noise reduction techniques (such as cowling of noisy plant) would reduce the area exposed to noise levels of 69dB L_{Aeq} to a strip of approx. 15m width which is very unlikely to be of significance for SPA/Ramsar birds. Impacts associated with surface works associated with construction of the CO_2 Gathering Network within the Sembcorp No. 2 Tunnel are anticipated to be similar to this. The impact on SPA/Ramsar birds of construction within the tunnel will be minimal given that construction will be underground.

6.1.16 The CO2 Gathering Network Pipeline will cross the River Tees in the existing Sembcorp No.2 Tunnel therefore no surface noise impacts will occur. SPA birds using habitat along the CO_2 Gathering Network Pipeline such as Dabholm Gut and Bran Sands lagoon are likely to be adapted to the presence of people given the historic use of this location as an industrial area with extensive human activity. However, since the works will be potentially as close as 24m from these features some visual screening is considered necessary to avoid a significant effect. Mitigation for visual disturbance risk is set out in in paragraph 6.1.22.

6.1.17 According to the most recent available Cleveland bird reports the common tern colonies at Saltholme were principally on rafts within the main lake and Paddy's Hide/Paddy's Pool; the closest of these is approximately 350-400m from the Proposed Development. Therefore, the common tern breeding colonies would be beyond the zone of noise impact from construction or decommissioning.

6.1.18 Since Natural England have affirmed that provided noise levels at the bird are below 70 dB no adverse effect on integrity will arise, a conclusion of no adverse effect on the integrity of the Teesmouth & Cleveland Coast SPA/Ramsar can be drawn. ES Figure 11-3 (ES Volume II, Document Ref. 6.3) illustrates the noise contours around the CO_2 Gathering Network and is included for reference in Appendix E of this HRA.

General Mitigation Measures

6.1.19 Further mitigation measures for noise impacts are set out in Chapter 11: Noise and Vibration (ES Volume I, Document Ref. 6.2). It stipulates that a Final Construction Environmental Management Plan (CEMP) will be prepared to which will include measures to limit noise disturbance to Noise Sensitive Receptors (NSRs). While the Final CEMP is not specifically designed to reduce impacts on bird species, any measures included will also mitigate noise impacts in the SPA / Ramsar by reducing noise levels at the birds. A list of relevant measures for noise mitigation in the Teesmouth and Cleveland Coast SPA / Ramsar includes:

- Attaining acceptable noise limits (70 dB L_{Aeq}) at nearby NSRs, including roosting and loafing birds in the SPA / Ramsar pools.
- No construction works at all within the SPA / Ramsar site;
- Applying measures to limit noise wherever possible and to achieve Best Practicable Means (BPMs) are achieved;
- Fabricating building elements off-site wherever possible;
- Applying maintenance and silencing (where possible) of all plant, equipment and machinery used; turning any equipment off when not in use;
- Loading / unloading machinery and dismantling equipment in less noise sensitive locations and / or providing screens to minimise disturbance of SPA / Ramsar birds;
- Routing of construction traffic along public roads and access tracks with longest potential distance to known NSRs in the SPA / Ramsar;

- Using visual screens (particularly when working in or near SPA / Ramsar pools and lagoons) for works associated with the CO_2 export pipeline and the CO_2 gathering network.

6.1.20 The framework CEMP submitted with the DCO application (and which the detailed CEMP approved pursuant to a DCO Requirement must be in accordance with) will be put in place, which will reduce the noise in relevant parts of the SPA / Ramsar to acceptable levels for qualifying birds. Considering this in conjunction with the habituation of birds to existing high noise levels in the wider area, it is concluded that the construction phase of the Proposed Development will not result in adverse effects on the Teesmouth and Cleveland Coast SPA / Ramsar regarding visual and noise disturbance. With the aforementioned measures included in a CEMP, a conclusion of no adverse effect on integrity could be drawn.

Effects on foraging resources of SPA / Ramsar birds

6.1.21 The emplacement of the new outfall head and the installation of the associated rock armouring / scour protection would result in permanent loss of subtidal sandflat. Despite the loss of 100m^2 of sandflat habitat due to rock armour around the outfall head, the introduction of rock armouring / scour protection (with an expected volume of 250 m^3) would also provide artificial reef habitat that is likely to be colonised by fauna and flora, some of which are themselves likely to constitute prey species (or food for prey species) on which the birds of Teesmouth and Cleveland Coast SPA / Ramsar birds feed, since the species for which the open water parts of the SPA is designated (foraging terns) are not highly selective feeders. Even if, as a worst case, the subtidal rock armour was not colonised by any invertebrates or fish on which the SPA birds forage it would still constitute 100m^2 out of approximately 10,000ha of subtidal mudflat and sandflat (0.0001% of the total) which would be imperceptible in terms of its effect on total prey biomass. The small loss of sandflat is therefore not expected to result in any net change in habitat for the prey species of the birds for which the Teesmouth and Cleveland Coast SPA / Ramsar site are designated.

6.1.22 The introduction of hard artificial substrates in areas otherwise characterised by sandy mobile substrates does have the theoretical potential to facilitate the establishment and spread of invasive non-native species (INNS). However, the prevalence of these species in the study area is very limited[11]. This, coupled with the small physical extent of the rock armour and lack of surrounding artificial hard substrata in Tees Bay (Png-Gonzalez et al 2021) (meaning the armour is a small island of rock amid large expanses of natural sandflat), renders it unlikely that the rock

[11] See the following website [redacted] and the intertidal/subtidal benthic appendices, in which no INNS were recorded except for Wakame *Unidaria pinnatifida*.

armour would act as a stepping-stone for INNS to disperse as there is nowhere nearby from, or to, which any species would colonise and few species around to do so. Furthermore, ensuring the armour is clean before being introduced will avoid the risk of bringing invasive species into the area, while planned roughing of the rock armouring will increase the likelihood of native species colonising these structures rather than INNS (Perkol-Finkela et al 2017).

6.1.23 Appendix F documents an analysis by a coastal process specialist of the sediment process implications of the rock armour. Its conclusions are summarised here. The footprint of the scour protection is likely to be a 10-12m diameter circle. The circular footprint allows the structure design to accommodate variations in current direction and near-bed wave orbital velocities which will also vary depending on the incident wave direction. The outer edge of the scour protection will incorporate a slope that transitions from the upper level of the rock armour to the surrounding seabed levels. To minimise the effect of the protection works on hydrodynamic conditions and consequently seabed morphology, best practice in design involves aligning the structure so that side slopes are perpendicular to the dominant flow directions. The circular footprint for the proposed scour protection therefore follows this design philosophy minimising any near-field and far-field effects. To further mitigate the depth of scour around the perimeter of the protected area, shallow sides slopes (i.e. 1:2 or less) will be incorporated into the design and the height of the protection above the seabed should be limited to less than 1m which represents approximately 25% of the water depth at low water on a mean spring tide. In addition, the vertical projection of the rock armour above the seabed will be limited to 1m to avoid interfering with wave propagation that could in turn affect sediment transport processes. Based on the analysis in Appendix F and the mitigation measures above it can be concluded that there will be no adverse effect on the integrity of the Teesmouth & Cleveland Coast SPA / Ramsar due to coastal process impacts from the rock armour.

6.1.24 Therefore, no adverse effect on the integrity of Teesmouth and Cleveland Coast SPA / Ramsar is expected from the placement of rock armour around the outfall head.

Atmospheric Pollution (Operation)

6.1.25 Potential operational atmospheric pollution effects of the Proposed Development were screened in for Appropriate Assessment, primarily due to the extent of additional nitrogen deposition forecast in the form of Nitrogen Dioxide (NO_2) and Ammonia (NH_3), on avocet and tern nesting habitats from the carbon capture absorber stack.

6.1.26 The following are relevant key extracts from Natural England guidance for the assessment[12]:

- Paragraph 5.26 states that *'An exceedance [of the critical level or load] alone is insufficient to determine the acceptability (or otherwise) of a project'.* So, the basic fact that the critical level for oxides of nitrogen (NOx) or critical load for nitrogen are already exceeded is not a legitimate basis to conclude that any further NOx or nitrogen (no matter how small) will result in an adverse effect;
- Paragraph 4.25 states that *'…1% of critical load/level are considered by Natural England's air quality specialists (and by industry, regulators and other statutory nature conservation bodies) to be suitably precautionary, as any emissions below this level are widely considered to be imperceptible…There can therefore be a high degree of confidence in its application to screen for risks of an effect'.*

6.1.27 The APIS website details Critical Loads applicable for each designated European site, which enables the sensitivity of each interest feature present within the site to be assessed. Scrutiny of the webpage for the Teesmouth and Cleveland Coast SPA identifies that:

- The only species for which APIS suggests adverse effects may occur due to elevated NOx or nitrogen deposition is the nesting terns and avocets[13]; and
- No species are identified as being adversely affected by changes in SO_2 concentrations or acidification.

6.1.28 At high concentrations, NOx can be directly toxic to vegetation, but its main importance is as a source of nitrogen, which is then deposited on adjacent habitats. APIS identifies that negative effects of NOx in the atmosphere (as distinct from its role in nitrogen deposition) are most likely to arise in the presence of equivalent concentrations of sulphur dioxide (SO_2). APIS indicates that background SO_2 concentrations at the Teesmouth SPA are very low (a maximum of 2 µg/m^3) compared to a Critical Level for SO_2 of 20 µg/m^3. Since the SO_2 concentrations are so low, no synergistic effect with NOx is expected.

6.1.29 The Teesmouth SPA is designated for breeding terns and avocet, and for passage / wintering waterfowl and waders. Therefore, the direct toxicity effects of NH_3 on vegetation are likely to be less ecologically important to the site than the role of NH_3 in nitrogen deposition. In any event, there is no part of the Teesmouth SPA where total NH_3 concentrations (including from the Proposed Development) are forecast to

[12] Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. Version: June 2018'. [redacted] It is noted that this was initially written for road traffic, but the basic principles quoted apply to all sources.

[13] www.apis.ac.uk

exceed the 3 µg/m^3 Critical Level of relevance for the general protection of vegetation.

6.1.30 The work for the ES has identified that the habitat feature within the part of the Teesmouth SPA where the maximum impact occurs is less sensitive to nitrogen deposition than was presented in the PEIR. In the PEIR, the most stringent Critical Load Class for nitrogen deposition impacts was determined from the APIS website to be 'Coastal Stable Dune Grasslands – acid type', with a Critical Load range of 8 – 10 kg N/ha/yr. Further consideration of the habitat type present in the area where the highest impacts from the CCU absorber stack are predicted to occur has identified 'Coastal Stable Dune Grassland – calcareous type', with a Critical Load range of 10 – 15 kg N/ha/yr, as a more appropriate Critical Load range to apply. The nitrogen deposition impacts presented in this Appropriate Assessment, have therefore been compared to the lower value in this Critical Load range (i.e. 10 kg N/ha/yr). In consultation with Natural England in January 2021, they agreed with this approach.

6.1.31 The Project ecologists have confirmed that the sensitivity of the Teesmouth SPA, in the vicinity of where the highest impacts from the CCU stack emissions occurs, is likely to be low given that some of this area comprises the old slag heaps from the steel works and some of the area is subject to tidal washing.

6.1.32 The original assessment, as reported in the PEIR and used for the LSEs assessment reported earlier, was based on three Power and Capture units, however only one is now proposed. Updated modelling has therefore been undertaken by air quality specialists for the Environmental Statement (Appendix 8B [**APP-248**]). This has predicted the atmospheric nitrogen deposition arising from the Proposed Development, based on a 115 m (above ground level) stack necessary to address air quality issues, no reheat and ammonia emission of 1mg/Nm3. The model results were plotted as isopleths showing nitrogen deposition in kg/ha/yr (see ES Addendum Figure 8-9 Rev. 2 (ES Addendum Volume II, Document Ref. 7.8.2) included for reference in Appendix E of this HRA).

6.1.33 The maximum predicted nitrogen deposition to the terrestrial (rather than intertidal or subtidal) parts of Teesmouth and Cleveland Coast SPA/Ramsar north-east of the PCC Site represents 3.9% of the lower Critical Load for calcareous coastal stable dune grasslands (Table 8B-19 of the Appendix 8B [**APP-248**]).

6.1.34 The area of peak nitrogen deposition comprises intertidal mud- and sandflats in the Coatham Dunes. However, parts of this area are subject to frequent tidal washing, rendering them less sensitive to the impacts of nitrogen. Most notably from the point of view of Appropriate Assessment, the area to the north of the PCC Site is not used by nesting terns or avocets (the two species groups for which the SPA is designated that are potentially sensitive to nitrogen deposition on their habitats).

6.1.35 The main avocet and common tern nesting sites lie in Saltholme Reserve approx. 5km to the south-west of the CCU absorber stack. The dose forecast at the Reserve due to the Proposed Development equates to approx. 0.2% of the annual Critical Load for littoral sediment and the common terns are understood to nest on a raft in the lake, which will be impervious to nitrogen deposition. The main active little tern

colonies are at Crimdon Dene and Seaton Carew, which comprise coastal stable dune grasslands with a minimum Critical Load of 10 kg N/ha/yr. The nitrogen deposition dose forecast at these locations due to the Proposed Development is less than 0.5% of the annual Critical Load.

6.1.36 Given that the known nesting sites for avocets and terns would be subject to a nitrogen dose far lower than 1% of the Critical Load, it is unlikely that atmospheric pollution from the Proposed Development would have significant impacts on the SPA's / Ramsar's breeding bird interest 'alone'. Moreover, in practice the suitability of an area for nesting terns will be less tied to the specific Critical Load (which is only a rough proxy for tern nesting habitat) and precise botanical effects, and more to do with coarse habitat structure i.e. they nest on the beach just above the high tide line, which is very sparsely vegetated (see below screencap from the 2020 Cleveland Little Tern Project Monitoring Report[14] for an image of the nesting location).

The area to the south of the main colony area where the terns successfully nested.

6.1.37 Therefore, the tern interest of this SPA is considered to be of low susceptibility even if the dose due to the Proposed Development exceeded 1% of the Critical Load and a conclusion of no adverse effect on integrity can be drawn. In email correspondence[15] discussing these results to aid in the preparation of this Appropriate Assessment, Natural England agreed that an adverse effect on the integrity of the SPA / Ramsar via this impact pathway would not arise.

[14] INCA. (2020). Little Tern Project – 2020 Report. 23pp
[15] Email from Natural England dated 22/01/21

6.1.38 Historically, a little tern breeding colony has also been found at South Gare, which lies considerably closer to the Proposed Development. Even here, however, atmospheric nitrogen deposition is not modelled to exceed 1% of the Critical Load. A recent report[14] identifies that little terns attempted to nest at South Gare in 2020, but no successful nests were recorded there, and it is understood this area is considered no longer viable for nesting. The South Gare location is therefore not further included in this Appropriate Assessment.

Water Quality (Construction, Decommissioning and Operation)

6.1.39 Water quality impacts during the construction and decommissioning periods were screened in for Appropriate Assessment in the LSEs stage. This was primarily due to the proximity of the Proposed Development to Coatham Sands and the River Tees, both components of the Teesmouth and Cleveland Coast SPA / Ramsar. Negative effects of the construction/decommissioning phase on water quality could primarily occur as a result of synthetic and non-synthetic pollutants (from fuel / oil spills, leaking machinery, inappropriate storage of materials and sedimentation) reaching the SPA / Ramsar via surface runoff, groundwater seepage or travelling in combined sewerage systems. The water quality in the pools of the Coatham Sands dunes is of particular importance, because they are used by foraging and roosting SPA / Ramsar birds and lie directly adjacent to the main works of the Proposed Development.

6.1.40 A supplementary Habitat Information Report (HIR) was undertaken for the part of the Coatham Sands that comprise the dune habitats adjoining the Proposed Development (Appendix 12H of the ES). As a first step, a Phase 1 habitat survey in the dune system of Coatham Sands was undertaken by AECOM on the 4th of June and 8th of July 2020. While the main purpose of these two habitat surveys was to establish the nature conservation importance of the on-site ecological communities, important information on the condition and significance of the SPA / Ramsar pools was also obtained.

6.1.41 A general finding of the Phase 1 Habitat Survey was that many of the standing waterbodies in the dunes are ephemeral, experiencing high seasonal drawdowns. As such, not all pools in the dunes are likely to be suitable to support roosting or loafing birds throughout the year. For example, Figure 12H.1 of the HIR indicates that target notes 8, 6 and 14 represent swamps, which (in the condition at the time of survey) would be unsuitable for supporting SPA / Ramsar birds.

6.1.42 Only two existing waterbodies in the Coatham Sands part of the SSSI were documented. Waterbody 9 (target note 6) is a remnant of a larger waterbody that at the time of survey (July 2020) was dominated by swamp. Waterbody 14 (target note 3) is shallow and was found to fragment into several discrete waterbodies in the summer months. Time series aerial imagery on Google Earth indicates that the Coatham Sands part of the SSSI historically contained more extensive open water and wetland habitats than it currently does. The recent drying or terrestrialisation of the dune pools indicates that this part of the SPA / Ramsar may slowly lose its

supporting role for SPA / Ramsar wildfowl[16]. It is important to note that both these waterbodies may increase in extent in the winter months as a result of higher precipitation. Therefore, their potential to support foraging, roosting or loafing SPA / Ramsar birds is likely to increase towards the overwintering period of the birds.

6.1.43 Within the dunes of the Coatham Sands part of the SSSI, the two waterbodies also lie close to the red-line boundary of the Proposed Development. Waterbody 9 lies approx. 121m from the PCC Site, whereas waterbody 14 lies even closer to the development area (approx. 19m). Given these short distances, there is a high risk that both construction/decommissioning and operational activities (if inappropriately managed or carried out) would result in water quality impacts in the pools of the Teesmouth and Cleveland Coast SPA / Ramsar.

6.1.44 Chapter 13: Aquatic Ecology (ES Volume I, Document Ref. 6.2) addresses the potential effects of the Proposed Development on aquatic ecology features, including via impacts on water quality. The ES chapter highlights that there may be potential effects on several habitat and ecological features of the Teesmouth and Cleveland Coast SPA / Ramsar, including the River Tees, ditches, ponds in the Coatham Sands, fish and macroinvertebrates.

6.1.45 Given the Proposed Development's proximity to the River Tees and its hydrological connectivity with the North Sea, water quality impacts in the marine environment during and post construction (and during decommissioning) also require consideration. Changes in marine water quality (such as through the input of toxic or non-toxic pollutants or sediments) have the potential to lead to changes in the macroinvertebrate and fish communities, ultimately affecting the foraging resources available to terns or harbour porpoise.

6.1.46 The design process for the Proposed Development has considered ecological constraints and measures to reduce the potential for adverse effects on qualifying habitats / species. Many of these measures represent environmental best practice or are legislative requirements. The following impact avoidance measures are included in the Proposed Development and will enable adverse effects on the water quality in freshwater and marine habitats to be avoided, both during the construction/decommissioning and operational periods:

- Compliance with industry good practice and environmental legislation during construction, decommissioning and operation
- Commitment to deliver a Final Construction Environmental Management Plan (CEMP), detailing the environmental protection measures (e.g. safe materials storage, emergency clean-up plans for leaks and spills, etc.)

[16] It is noted here that the pools were recently included in the Teesmouth and Cleveland Coast SPA / Ramsar due to their role in supporting foraging, roosting or loafing qualifying bird species. However, this supporting role may be gradually declining.

- Minimisation of surface or underground water flow into the ponds of the Coatham Dunes units of the Teesmouth and Cleveland Coast SSSI during construction and decommissioning.

6.1.47 Chapter 14 Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2) highlights that a Final CEMP and Site Waste Management Plan (SWMP) will be prepared and implemented for the Proposed Development, in order to minimise impacts on the environment. The following features of these plans will avoid negative impacts on the marine water quality:

- Adherence to the latest Pollution Prevention Guidance and other good practice methods to protect the water environment (see Chapter 9: Surface Water, Flood Risk and Water Resources (ES Volume I, Document Ref. 6.2).
- Water Management Plan (WMP) setting out measures to:
  - reduce the risk of construction site run-off or dewatering containing fine sediment
  - safe storage, handling and disposal of potential pollutants
  - adequate management of activities within or adjacent to waterbodies (freshwater, estuarine and marine)
  - preparation of emergency response equipment / plans.

6.1.48 Further specific mitigation guidance is identified in Chapter 9: Surface Water, Flood Risk and Water Resources (ES Volume I, Document Ref. 6.2) to reduce surface run-off, dispersion of suspended sediments and spillage risk in the construction/decommissioning periods. The provided mitigation measures include:

- Temporary drainage system during construction/decommissioning to prevent surface run-off;
- Safe storage of flammable, toxic or corrosive material within bunded and secured areas;
- Refuelling, oiling or greasing of machinery above drip rays or other impermeable surfaces;
- Provision of wash down facilities for machinery; and
- Continued water quality monitoring in relevant waterbodies against established baseline levels, for any pollution incidents to be dealt with effectively.

6.1.49 Effects on marine water quality during the operational period will be mitigated by a formal drainage strategy. Water quality testing of any treated water prior to discharge will ensure that the marine water quality is maintained.

6.1.50 In March 2022, Natural England published advice to competent authorities regarding the effects of increased nutrients on a series of European sites around England. For these identified European sites, Natural England's advice was that their ability to achieve their conservation objectives was compromised by existing nutrient inputs

from agricultural and treated effluent sources. As a result, Natural England advised that any net new housing growth in the surface water catchments of these European sites would require 'nutrient neutrality' to be applied. In other words, the increase in nutrients from an increase in treated domestic wastewater effluent would need to be offset by a reduction in nutrients through other means. Although the nutrient neutrality approach generally excludes non-residential development, it does apply to some industrial processes, which includes the Proposed Development.

6.1.51 In their March 2022 letter, Natural England identified Teesmouth & Cleveland Coast SPA as one of the European sites suffering from excess nutrient inputs. According to the Natural England letter, the surface water catchment of the SPA covers a very large area stretching from Teesmouth in the east to the Cumbria border in the west. With regard to the parts of Teesmouth & Cleveland Coast SPA that are considered vulnerable, Natural England confirmed in July 2022[17] that the concern is not with discharges to Tees Bay but with the potential for migration of dissolved inorganic nitrogen back into the estuary/Seal Sands as that is the part of the SPA in unfavourable condition due to nitrates. This is partly because nitrogen results in smothering algae on the foreshore, which renders the habitat anoxic and interferes with the ability of SPA birds to forage. Tees Bay effectively consists of two elements with different ecological functions for SPA birds: the intertidal area (Coatham Sands) used particularly by non-breeding waders and waterfowl during the winter/passage period, and the open water of the bay itself used by foraging terns. Unlike the intertidal mudflats of the estuary (e.g. Seal Sands) surveys undertaken for the Proposed Development indicate that the intertidal sandflats of the open bay have low macro-algal diversity and abundance. Wakame (Undaria pinnatifida) was reported as the only INNS currently known to be present and growing within the Study Area. This is most likely due to a combination of increased exposure to wave action and storms, as some degree of shelter is required to help mats form, and the much greater mixing that is available in the bay compared to the estuary. Algae mats are generally much more likely to form in estuarine environments where nutrients are already high, with less mixing and with multiple source inputs of nitrogen. There is little data on existing DIN for the bay as the Environment Agency do not monitor this parameter in the bay; however, the low macro-algal abundance despite existing nitrogen levels in the bay indicates that the Proposed Development will not change the low risk of algal accumulation in the intertidal zone of Coatham Sands.

6.1.52 Tees Bay is included in the SPA designation to protect the open water areas of greatest foraging importance to the little terns at Crimdon Dene and the open water areas of greatest foraging importance to the common terns at Saltholme. The part of Tees Bay within the SPA designation is an area of c. 10,000 ha and neither tern species is a highly selective feeder, foraging on a wide range of fish and invertebrates.

[17] Email from Nick Lightfoot at Natural England dated 22/07/22

As a result, prey biomass is likely to be more important than diversity or species richness. Moreover, Warren (2018) and research reported in Econ (2014) identified that physical parameters such as tidal currents, wave height and wind speed, and biological factors such as the presence of predatory fish competing with the terns, all importantly influence prey available near the surface for both common and little tern, and the spatial and temporal predictability (or otherwise) of these processes may be more important than the absolute density of prey in a given area. While marine water clarity can be affected by pollution (such as by nutrients causing plankton blooms in the water column) spatial differences in water turbidity can have both negative effects (obscuring prey from the predator) and positive effects (making it less likely the prey detect the predator and increasing food for prey drawing more of them to the surface). Holbech et al (2018) found that water clarity had no effect on prey capture success by common terns, while Econ (2014) suggests turbid waters may be an essential prerequisite for foraging little terns.

6.1.53 As reported in the WFD report, the far-field water quality monitoring results for Dissolved Inorganic Nitrogen (DIN) indicate that the average impact of the effluent discharge over the tidal cycle is to increase DIN concentrations in Tees Bay by up to 10% around the outfall but by only 1-5% in the wider area. The Environment Agency does not have a published DIN status class for the Tees Coastal waterbody. However, the extent of EQS breaches is spatially limited in terms of extent and duration and does not occur at the surface. This is relevant for both the intertidal zone and for foraging birds as nitrogen in the surface layers will have greatest effect on the intertidal zone and fish presence at the surface is a major factor influencing foraging success. Given the major role of physical and biological (competition) factors in influencing predation behaviour and success, the variability in some of these factors, and the 10,000 ha size of the designated part of Tees Bay compared to the population of terns (approximately 480 pairs based on the Defra departmental brief at the time the SPA was extended into the marine environment), an increase in dissolved inorganic nitrogen to the Tees Bay as a result of the Proposed Development would not materially affect its ability to provide adequate sustenance to maintain the tern populations. Based on Natural England's advice that the concern relates to ~~is over~~ Seal Sands, the Proposed Development has redirected all effluent containing nitrogen away from Dabholm Gut and to Tees Bay, specifically in order to avoid exacerbating nutrient issues at Seal Sands.

6.1.54 The Applicants' modelling shows that there would be no adverse effect on total nitrogen loading at Seal Sands relating to the outfall in Tees Bay (based on analysis of mixing zones), because the amount of nitrogen reaching Seal Sands from the outfall is more than offset by the nitrogen the Proposed Development will be removing from Seal Sands by directing existing water containing nitrogen to Tees Bay. This is discussed further in the Nutrient Nitrogen Briefing Paper (Document Reference 9.36, submitted at Deadline 9). As a result, it can therefore be concluded there would be no adverse effect on the integrity of the SPA/Ramsar site due to an increase in nutrients to Tees Bay from the Proposed Development.

~~6.1.49~~6.1.55 Considering the specific mitigation measures identified in Chapters 13 (Aquatic Ecology) and 14 (Marine Ecology) (ES Volume I, Document Ref. 6.2), some of which are part of the inherent development design, it is concluded that the Proposed Development will not result in adverse effects on the Teesmouth and Cleveland Coast SPA / Ramsar regarding water quality.

Direct landtake (HDD) collapse (Construction)

~~6.1.50~~6.1.56 Available soils data, refer doc NS051-CV-REP-OA1-00008 Preliminary Onshore Ground Investigation for Net Zero Teeside Ground Investigation Report, suggests the ground conditions are suitable for current HDD technology giving confidence a successful HDD can be undertaken subject to further GI and detailed design. Methods exist, such as using a conductor pipe, to reduce the risk of frac out off-shore as part of standard design. Confirmatory ground investigation is being undertaken later this year to optimise the drilling programme, design and methodology and the selection of drilling fluids to reduce the consequence and probability of a frac-out. The Applicants confirm that water based drilling fluids that are inert in the marine environment will be used during HDD operations to minimise any potential effects on the marine SPA. These will also disperse readily in the marine environment.

~~6.1.51~~6.1.57 All of these measures are inherently taken into account in designing and delivering a robust HDD irrespective of the designation status of the surface environment. Natural England, in a letter dated 01/07/22, confirmed their agreement that there is unlikely to be a significant effect from HDD collapse. However, they did request that a 'clean-up plan' is produced in the very unlikely event that a collapse did occur. Such a document has now been produced by the Applicants in response to the ExA's Action 10 following ISH4. The contractor will also undertake analysis to identify key parameters to be monitored during installation and subsequently monitor the drilling operations to ensure parameters remain within safe operating envelope. Given these integral elements of HDD design and delivery it is not considered that an adverse effect on integrity on the SPA/Ramsar due to collapse and associated habitat loss would arise. The contractor will also undertake analysis to identify key parameters to be monitored during installation and subsequently monitor the drilling operations to ensure parameters remain within safe operating envelope. Given these integral elements of HDD design and delivery it is not considered that an adverse effect on integrity would arise due to HDD collapse and associated SPA habitat loss.

6.2 North York Moors SAC / SPA

Atmospheric Pollution (Operation)

6.2.1 The North York Moors SAC / SPA was screened in based on air dispersion modelling undertaken for the PEIR. The isopleths showed that a nitrogen deposition dose between 0.1 and 0.2 kg N/ha/yr was expected in a large section of the North York Moors SAC / SPA, equating to between 1 and 2% of the annual Critical Load for heathlands. This was above the 1% threshold used by statutory bodies to distinguish between negligible and potentially impactful projects and plans.

6.2.2 Since submission of the PEIR, some specifications of the Proposed Development and its process technology (e.g. the number of CCGT trains and stack height) have changed. These have significantly lowered the modelled pollutant emission from the stack, primarily due to reductions in the amount of ammonia produced. As a result, nitrogen deposition due to the Proposed Development is now a maximum of 0.2% of the critical load (i.e. well below the threshold to be imperceptible). This means that, based on aforementioned Natural England guidance regarding the use of the 1% of the critical load criterion, a conclusion of no adverse effect on integrity could be drawn.

6.3 Southern North Sea SAC

Disturbance in Functionally Linked Habitat (Construction / Decommissioning)

6.3.1 Disturbance in functionally linked habitat, primarily through Unexploded Ordnance (UXO) detonations, in relation to harbour porpoise was screened in for Appropriate Assessment in the LSE section of this report. Harbour porpoise are a high-frequency cetacean, a functional hearing group that has lower auditory thresholds to impulsive sound elements, such as UXO detonations. If sufficiently close to the animals, such detonations may lead to Temporary Threshold Shifts (TTS) or Permanent Threshold Shifts (PTS) in affected individuals. Baseline information suggests that harbour porpoise occur from time to time in the Tees Bay, indicating that activities involving impulsive sound elements may affect the way in which these animals use the wider area.

6.3.2 To determine whether impulsive sound sources associated with the construction phase of the Proposed Development (e.g. UXO detonations) may exceed the hearing thresholds of marine ecological receptors, a simplified geometric spreading model was used in Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2). Specifically, sound propagation associated with UXO explosions was calculated using a semi-empirical formula originating from the Kirkwood-Bethe propagation theory, presented by Soloway and Dahl (2014) (see Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2 for a full explanation of the modelling approach). Two equivalent charge weights of Trinitrotoluene (TNT) of 55kg and 100kg were modelled, the latter representing a typical WWII North Sea air-dropped ordnance. It is to be noted that a requirement for UXO disposal will remain hypothetical during the consenting process, due to the exact number, location, nature and disposal of UXOs being unknown.

6.3.3 The results of the underwater sound modelling were then compared to the sensitivity thresholds of marine mammals to estimate the distances at which received sound levels decrease to levels below those that are expected to result in ecological effects (i.e. impact zones were determined). Importantly, the impact distances are based on an assumption that both sound source and ecological receptors will remain stationary. However, mobile animals are expected to minimise the amount of time within close proximity to an impulsive sound source, such that utilising the approach of sound exposure level (SEL) is considered to be highly precautionary. The geometric spreading model indicates that TTS in high-frequency

cetaceans, an adequate proxy for the onset of behavioural impacts, could occur up to over 10km from the site of potential explosions (see **Table 4~~Table 4~~**.1).

Table 4.1: Impact zones of UXO detonations for high-frequency cetaceans, as presented in Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2).

55 kg charge weight		100 kg charge weight	
PTS	**TTS**	**PTS**	**TTS**
6.1km	>10km	7.4km	>10km

6.3.4 The Joint Nature Conservation Committee (JNCC) recommends a range of mitigation techniques to minimise the risk of injury or disturbance to marine mammals[18], including visual monitoring by Marine Mammal Observers, Passive Acoustic Monitoring (PAM), pre-detonation searches for marine mammals, sequencing of explosive charges (where feasible) and the use of Acoustic Deterrent Devices (ADDs). These standard JNCC Guidelines for explosions will be adopted for the Proposed Development as good practice mitigation, which will ensure that any temporary impacts on harbour porpoise will be minimised.

6.3.5 While the requirement for UXO detonations remains unknown, the overall number is expected to be low due to the small extent of anticipated marine construction works. Any effects would likely be infrequent and short-term, allowing harbour porpoise to return to the Tees Bay following completion of any UXO detonations. It is not considered that any UXO detonations would be associated with decommissioning. Chapter 14: Marine Ecology and Nature Conservation (ES Volume I, Document Ref. 6.2) has determined effects of UXO detonations on cetaceans to be not significant.

6.3.6 Guidance from the JNCC, DAERA, and Natural England, regarding the assessment of effects from underwater sound source impacts in relation to SACs designated for the protection of harbour porpoise, indicates the maximum distance for significant disturbance, or Effective Deterrence Range (EDR), from high order detonations of UXOs (as reported by Tougaard *et al.,* 2013, for large diameter monopiles[19]) is 26 km (JNCC *et al.*, 2020). The Southern North Sea SAC is located approximately 102 km from the Proposed Development. This is a considerable distance beyond the range within which a behavioural response to a sound source may be observed. Therefore, UXO detonation would not breach the area/time thresholds for assessing adverse effects on harbour porpoise SAC site integrity as defined by the JNCC *et al.* (2020).

[18] Joint Nature Conservation Committee. (August 2010). JNCC guidelines for minimising the risk of injury to marine mammals from using explosives. 10pp.

[19] In the absence of empirical evidence of harbour porpoise avoidance of high order detonation of UXO, the JNCC have recommended the use of this 26 km EDR value.

6.3.7 Overall, given the relatively low use of the Tees Bay by harbour porpoise, the distance of the Southern North Sea SAC to the Proposed Development and the standard mitigation measures included as part of the JNCC Guidelines, it is concluded that there will be no adverse effects on the integrity of the Southern North Sea SAC regarding disturbance in functionally linked habitat.

7.0 IN COMBINATION EFFECTS

7.1.1 It is a requirement of Regulation 63(a) of the 2017 Regulations to not only assess the impacts of a development project alone, but also to investigate whether there might be 'in-combination' effects with other projects or plans. In practice, such an 'in-combination' assessment is of greatest relevance when an impact pathway relating to a project would otherwise be screened out – not because there is no impact pathway – but because its individual contribution is considered not to result in likely significant effects.

7.1.2 For the purposes of this HRA, we have identified several plans, projects and strategies proposing / aiming for development, which may act in-combination with the Proposed Development (see **Table 7.1**~~**Table 7.1**~~ below for a list of the most significant plans / projects). These are the projects and plans that have been identified as posing linking impact pathways to the same European sites as those identified for the Proposed Development. Other projects may be mentioned in Chapter 24: Cumulative and Combined Effects (ES Volume I, Document Ref. 6.2) but no link to European sites have been identified.

Table 7.1: Plans and projects with the potential for acting 'in-combination' with the Proposed Development. These plans and projects are at varying stages, ranging from conceptual phases to having obtained planning consent (see table text).

Other Plans and Projects	In Combination Effects
The offshore geological storage of carbon will form a separate element of this wider project. It will consist of: a) continuation of the CO_2 export pipeline from below MLWS to the geological storage facility, located approximately 145 km to the ESE of Teesside; and b) the geological storage facility itself, which will require the construction of either a sub-sea injection system or an un-manned platform for the injection of exported CO_2 using a well or wells bored into the underground storage reservoir over 1,000 m below sea level. The injection wells will be drilled and completed using a suitable mobile drilling rig.	There is potential for this element of the wider project (subject to a separate consenting process) to result in its own impacts on European sites. Most notably this could be through underwater sound impacts on harbour porpoise associated with Southern North Sea SAC (which lies 100km east of the PCC Site) during construction or decommissioning. This could arise either directly if the storage facility is located within the SAC, or indirectly, since the harbour porpoise population of the SAC is highly mobile. Other potential impacts on European sites could include water quality and sediment dispersal impacts of pipeline installation and construction/decommissioning on the same SAC or the marine open water component of the Teesmouth & Cleveland Coast SPA/Ramsar that is used for fishing by the designated tern populations. As the geological storage facility is located within the SAC, direct habitat loss could also be possible. Effects of the offshore components of the wider project will be evaluated in detail for that consenting process and will include any necessary mitigation measures to protect European sites. The potential for 'in combination' effects with the Proposed Development would arise if water quality (pollution) impacts on Teesmouth & Cleveland Coast SPA / Ramsar occurred due to both the Proposed Development and the marine component of the pipeline, or if harmful underwater sound impacts occurred because of both the Proposed Development and the marine pipeline or geological storage facility. Since that part of the overall project is at an earlier stage of development no detailed assessment of potential 'in combination' effects can be undertaken because the effects of that part of the wider project have not yet been investigated in detail. However, this Appropriate Assessment for the NZT DCO component of the wider project has investigated all potential impact pathways that could arise from the Proposed Development on European sites and concluded that either there is no realistic impact pathway (i.e. regarding impacts on harbour porpoise associated with Southern

Other Plans and Projects	In Combination Effects
	North Sea SAC) or that sufficient mitigation measures can be implemented to ensure that no adverse effect on integrity will arise (for example with regards to water quality impacts). If there is no realistic impact pathway no 'in combination' effect will arise no matter what the effects of the offshore scheme. Similarly, since all the potential adverse effects on integrity due to the Proposed Development will be removed due to the presence of the identified mitigation no actual 'in combination' effect can arise in practice. For example, the DCO has included mitigation to ensure no water pollution occurs from the Proposed Development; as such, there will be no 'in combination' effect irrespective of the effects of the offshore scheme. **Since the Proposed Development contains adequate mitigation to protect European sites, no 'in combination' effect will arise.**
Clean Growth Strategy (2017) – Sets out the aim of the UK Government to deliver increased economic growth while decreasing emissions. The Strategy sets out policies and proposals to reduce emissions over the next decade, including the use of carbon capture and storage.	The Clean Growth Strategy is a very high-level strategic document containing only broad policies (such as 'Providing up to £20 million to support a new clean technology early stage investment Fund'). These policies are not sufficiently specific in location, nature of potential schemes or details of potential schemes for any potential effects on specific European sites to be identifiable. **Therefore no 'in combination' effect will arise.**
Redcar & Cleveland Local Plan (Adopted May 2018) – The Redcar and Cleveland Local Plan sets out the vision and overall development strategy for the Borough in the planning period up to 2032. It details the provision of a minimum of 3,978 dwellings and 405 ha of employment land in the plan period.	Potential impacts to Teesmouth & Cleveland Coast SPA / Ramsar from both these plans include recreational pressure leading to disturbance simultaneously with pipeline construction / decommissioning work at Coatham Dunes. The Redcar & Cleveland Local Plan was subjected to Appropriate Assessment in 2016. This did consider what was then a proposed extension to the SPA (now designated), such as the inclusion of Coatham Marsh. That assessment considered that recreational pressure impacts on the SPA / Ramsar could arise from new housing development within 6km of the site, 6km being the zone within which 75% of visitors to the SPA / Ramsar site arose. It identified that 2,220 new dwellings

Other Plans and Projects	In Combination Effects
Stockton-on-Tees Local Plan & Policies Map (Adopted January 2019) – The Stockton-on-Tees Local Plan sets out the detailed strategic development targets for the Borough in the planning period up to 2032. It sets out that a minimum of 10,150 new homes and 300 ha of employment land will be provided within the plan period.	would be delivered in Redcar & Cleveland within 6km of the SPA / Ramsar over the plan period. The Appropriate Assessment identified that the Council would produce a Recreational Mitigation Strategy to address potential adverse effects on the SPA / Ramsar from recreation. AECOM has reviewed the HRA undertaken in 2016 and considers the analysis to be robust and in line with mitigation strategies developed elsewhere to address the same issue. Stockton-on-Tees Local Plan was subject to Appropriate Assessment in 2018. This identified that 42 allocated sites lie within 6km of the SPA / Ramsar site. It was ultimately concluded that growth in Stockton-on-Tees would not compromise delivery of the aforementioned Recreational Mitigation Strategy. Since there is an existing Recreational Mitigation Strategy for the SPA / Ramsar which has been deemed sufficient to address recreational pressure issues in Local Plans and since the Proposed Development also includes mitigation to ensure it will not have an adverse effect on integrity via disturbance, **no in combination effect will arise** as total disturbance levels will be insignificant.
Tees Valley Joint Minerals and Waste Development Plan Document (Adopted September 2011). This Development Plan Document (DPD) contains the area's overall approach to the use of mineral resources and the management of waste. It consists of the Minerals and Waste Core Strategy DPD and the Mineral and Waste Policies and Sites DPD.	There are no specific allocations made in the DPD. The waste sites policy states that 'Allocations and proposals for large waste management facilities should be located in the following general areas: a) to the south of the River Tees - the land located around Teesport, Smiths Dock Road and the eastern end of Dockside Road (Middlesbrough and Redcar and Cleveland); b) to the north of the River Tees - the land located around the Graythorp and Haverton Hill Road areas (Hartlepool and Stockton-on-Tees); and c) to the north of the River Tees - the land located around the Port Clarence, Cowpen Marsh and Seal Sands areas (Hartlepool and Stockton-on-Tees). However, it also states that, in determining the suitability of a site within these areas, consideration will be given to the potential impact on the protected European species associated

Other Plans and Projects	In Combination Effects
	with the Teesmouth and Cleveland Coast SPA / Ramsar and any functional land required to support them. Where likely adverse impacts are identified, avoidance or appropriate mitigation measures may be required. Since no specific allocations are made and there is a policy in the plan ensuring that adverse effects on the SPA / Ramsar will be avoided, and since the Proposed Development includes mitigation measure to ensure that it will not result in adverse effects on integrity, **no in combination effect will arise.**
South Tees Regeneration Master Plan (RMP, 2017) – The RMP is the overall vision and strategy for the South Tees area, seeking to bring new opportunities for investment and maximising economic development in the area.	The Master Plan contains proposals for redevelopment of the South Tees Development Corporation area, including illustrative phasing release plans and plans showing potential development for illustrative purposes. Potential impacts to Teesmouth & Cleveland Coast SPA / Ramsar include large-scale construction, leading to disturbance simultaneously with pipeline construction / decommissioning work at Coatham Dunes. However, the proposals it contains are not detailed. Rather, detailed proposals will be brought forward on a case by case basis. As such it is not possible to do a detailed analysis of potential in combination effects. However, any proposal that does come forward for planning consent must by law be subject to its own HRA, including appropriate assessment if necessary. As such there are mechanisms in place to ensure that no proposals that are brought forward can have an adverse effect on the integrity of the SPA / Ramsar, unless they can demonstrate Imperative Reasons of Overriding Public Interest and No Alternatives. This Appropriate Assessment has identified the mitigation and avoidance measures that will be incorporated into the Proposed Development to ensure no adverse effect on SPA / Ramsar site integrity and entirely address the impact of the Proposed Development through those impact pathways. Moreover, no potential impacts have been dismissed simply because the contribution of the Proposed Development is small but only because no realistic pathway exists (i.e. no residual, but individually insignificant, effects on European sites have been identified). As such, **no 'in combination' effect is identified.**

Other Plans and Projects	In Combination Effects
Tees Valley Combined Authority (TVCA) plans.	The TVCA has published three separate strategies ('Strategic Economic Plan', 'Investment Plan', 'Infrastructure Plan') that aim at increasing economic growth and creating more jobs in the Tees Valley area. Delivering these plans could result in a wide range of potential impacts to Teesmouth & Cleveland Coast SPA / Ramsar site depending on the details of individual proposals. However, as befits over-arching strategies, the three strategies produced by the Combined Authorities set out an overall vision and some high-level objectives (such as achieving 25,000 additional jobs by 2026) but do not provide detailed scheme information. The exception is regarding a number of transport proposals (such as to secure an additional strategic road crossing of the River Tees). No potential for 'in combination' effects has been identified when examining the limited information available about these initiatives. However, any proposal that does come forward for planning consent must by law be subject to its own HRA, including appropriate assessment if necessary. As such there are mechanisms in place to ensure that no proposals that are brought forward can have an adverse effect on the integrity of the SPA / Ramsar, unless they can demonstrate Imperative Reasons of Overriding Public Interest and No Alternatives. This Appropriate Assessment has identified the mitigation and avoidance measures that will be incorporated into the Proposed Development to ensure no adverse effect on SPA / Ramsar site integrity and entirely address the impact of the Proposed Development through those impact pathways. Moreover, no potential impacts have been dismissed simply because the contribution of the Proposed Development is small but only because no realistic pathway exists (i.e. no residual, but individually insignificant, effects on European sites have been identified). As such**, no 'in combination' effect is identified.**
ICL Tees Dock	The ICL Tees Dock will involve the refurbishment of a redundant 'coal rail pit' for handling polysulphate products, potash conveyor, Tees Dock Terminal and Teesport. An online search yielded no detailed proposals regarding this scheme. It lies approx. 1.9km to the south-west of the Proposed Development directly adjacent to the River Tees. It follows that the main relevant impact pathways involved are likely to be similar to those applicable to the Proposed Development, mainly water quality impacts during construction/decommissioning and operation,

Other Plans and Projects	In Combination Effects
	and visual / noise disturbance to SPA / Ramsar birds. However, the ICL Tees Dock is unlikely to be associated with atmospheric pollution impacts. It is to be noted that the planning application for this proposal was granted on 06/03/2019. This Appropriate Assessment has identified the mitigation and avoidance measures that will be incorporated into the Proposed Development to ensure no adverse effect on SPA / Ramsar site integrity and entirely address the impact of the Proposed Development through those impact pathways. Moreover, no potential impacts have been dismissed simply because the contribution of the Proposed Development is small but only because no realistic pathway exists (i.e. no residual, but individually insignificant, effects on European sites have been identified that would affect the same area as ICL Tees Dock given the 1.9km separation between the schemes). As such, **no 'in combination' effect is identified.**
York Potash Harbour Facilities Order and associated overhead conveyor and storage facilities (two separate planning applications)	The York Potash project will involve the installation of a wharf / jetty with two ship loaders, capable of loading 12 million tons of bulk dry material per annum. Dredging activities will be required to create a berth. The scheme is also to include a storage building and a materials handling facility. To transfer product between the handling facility and the port, an overland pipe conveyor will be constructed immediately north of the Bran Sands lagoon. The scheme website[20] acknowledges the ecological importance of the lagoon, which means that measures will be put into place to mitigate any negative impacts on the waterbody. The potash scheme lies directly adjacent to the Proposed Development and is therefore similarly situated in relation to the Teesmouth and Cleveland Coast SPA / Ramsar. The main relevant impact pathways are likely to include water quality impacts during construction / operation and visual / noise disturbance to SAC mammals during construction / decommissioning / operation, and direct temporary effects

[20] Available at: https://uk.angloamerican.com/the-woodsmith-project [Accessed on the 06/04/2022]

Other Plans and Projects	In Combination Effects
	on designated habitats. It is to be noted that these applications have existing planning consent and the Applicants are in regular dialogue with the potash scheme operator, such that when more detailed construction plans are available, the potential for cumulative effects will be identified to ensure adequate mitigation is in place to mitigate any potential for cumulative effects. This Appropriate Assessment has identified the mitigation and avoidance measures that will be incorporated into the Proposed Development to ensure no adverse effect on SPA / Ramsar site integrity and entirely address the impact of the Proposed Development through those impact pathways. While some dredging for the outfall head for the Proposed Development will be required, this will be very small in extent and physically widely separated from the dredging for the HFO berths being approximately 1km off-shore and would be expected to recover within 5 years. The temporary impact on benthic habitat, while significant locally to the outfall head, would not be expected to be significant in the context of the wider availability of these habitats in the area, and would not appreciably contribute to any 'in combination' loss of subtidal mudflat. The introduction of a small volume of rock armouring / scour protection due to the Proposed Development would provide artificial reef habitat that is likely to be colonised by fauna and flora, some of which are themselves likely to constitute prey species (or food for prey species) on which the birds of Teesmouth and Cleveland Coast SPA / Ramsar birds feed and there is a low risk of introducing or spreading invasive species. Moreover, the area of rock armour involved represents 0.0001% of the total area of subtidal sandflat in the SPA/Ramsar. The circular footprint, shallow side slopes and low elevation (1m) of the rock armour will also ensure no effect on coastal processes. The area of rock armour and effect on coastal processes are therefore so small and localised as to be imperceptible in terms of its effect on total prey biomass even 'in combination' with other projects and plans. Therefore, no adverse effect on the integrity of Teesmouth and Cleveland Coast SPA / Ramsar is expected from the placement of rock armour around the outfall head.

Other Plans and Projects	In Combination Effects
	As such, **no 'in combination' effect is identified.**
Dogger Bank Teesside A / Sofia Offshore Wind Farm	The second stage of Forewind Ltd.'s offshore wind energy development in the Dogger Bank Zone. It will comprise up to two wind farms, each with a capacity of up to 1.2GW, connecting to a National Grid substation at Lackenby. The overall Dogger Bank Zone comprises 8,660km^2 of the North Sea. This scheme will provide 'clean' renewable energy and therefore no operational atmospheric pollution impacts will occur. However, the following impact pathways will be relevant to the scheme: visual and noise disturbance effects during construction /decommissioning / operation, potential impacts on bird flightlines during construction /decommissioning / operation, and collision and direct mortality risks for SPA / Ramsar birds. The scheme is identified as 'Tier 1', meaning it has planning permission and a project-level HRA must have demonstrated no adverse effects on site integrity, both alone and 'in-combination'. The impact pathways identified for the scheme are different to the ones relevant for the Proposed Development. This Appropriate Assessment has identified the mitigation and avoidance measures that will be incorporated into the Proposed Development to ensure no adverse effect on SPA / Ramsar site integrity and entirely address the impact of the Proposed Development through those impact pathways. Moreover, no potential impacts have been dismissed simply because the contribution of the Proposed Development is small but only because no realistic pathway exists (i.e. no residual, but individually insignificant, effects on European sites have been identified that would affect the same area as Dogger Bank Teeside A given the spatial separation between the schemes). As such, **no 'in combination' effect is identified.**
Redcar Energy Centre (application R/2020/0411/FFM), Grangetown Prairie scheme (R/2019/0767/OOM) and Teesside Combined Cycle Power Plant (DCO Reference 2019)	These three schemes have been identified regarding the Teesmouth and Cleveland Coast SPA / Ramsar because they will all contribute to a cumulative increase in nitrogen deposition within the SPA / Ramsar site boundary over the same operational timescale as the Proposed Development. This issue is discussed further in the paragraphs below. The focus of the discussion is on the Redcar Energy Centre as this project is closest to the SPA/Ramsar and will therefore have the greatest 'in combination' effect with the Proposed Development.

7.1.3 The only in-combination pathway that requires more detailed consideration is that of air quality impacts from the operational facility on the Teesmouth & Cleveland Coast SPA / Ramsar.

7.1.4 Several other developments with potential effects on air quality near the boundary of the Proposed Development are also coming forward, including the Redcar Energy Centre (directly to the east of the Proposed Development) and the Grangetown Prairie scheme. A decision on planning consent for the Redcar Energy Centre is outstanding (although Natural England correspondence confirms no objection) but outline planning consent for the Grangetown Prairie scheme has been given. As set out in its HRA report, the Grangetown Prairie scheme had a maximum predicted nitrogen deposition of 9.4% of the annual CL of the most sensitive habitats in the Teesmouth and Cleveland Coast SPA / Ramsar.

7.1.5 The progress of these planning applications has significance for the Proposed Development in that any nitrogen emissions of these projects may have a cumulative impact on the Teesmouth and Cleveland Coast SPA / Ramsar. Notably, the predicted nitrogen deposition of the Redcar Energy Centre equates to a maximum of 16% of the annual Critical Load at the closest point of the SPA / Ramsar to that scheme (approx. 1km north-west to the area of maximum impact of the Proposed Development). It is estimated that at the Coatham Dunes (the area most impacted by this proposal), the nitrogen dose from the Redcar Energy Centre would be approx. 5% of the Critical Load. This would lead to an in-combination nitrogen dose of 8.6% of the annual Critical Load (Table B7 in Appendix B of Appendix 8B of the ES). However, as highlighted earlier in this section, there are no nitrogen-sensitive bird species that routinely use this part of the SPA / Ramsar.

7.1.6 Any in-combination nitrogen deposition effect at Saltholme Reserve and the little tern colonies (Crimdon Dene and Seaton Carew) would be significantly smaller, given that these sites all lie much further from the Proposed Development and the Redcar Energy Centre. In email correspondence[21] discussing these results to aid in the preparation of this Appropriate Assessment, Natural England agreed that an adverse effect on the integrity of the SPA / Ramsar via this impact pathway would not arise, even considering the Redcar Energy Centre and NZT projects 'in combination' with each other.

[21] Email from Natural England dated 22/01/21

8.0 CONCLUSIONS

8.1.1 Following the amendments made to the design of the operational development to reduce ammonia emissions, it is concluded that with the identified mitigation measures in place to address construction / decommissioning noise and construction, decommissioning and operational water quality impacts on the Teesmouth and Cleveland Coast SPA / Ramsar, there will be no adverse effect on the integrity of any European site either alone or in combination with other plans and projects.

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APPENDIX A RELEVANT IMPACT PATHWAYS

The European sites included within this screening assessment are:

- Teesmouth and Cleveland Coast SPA / Ramsar (including extension);
- North York Moors SAC;
- North York Moors SPA;
- Durham Coast SAC;
- Northumbria Coast SPA / Ramsar
- Berwickshire and North Northumberland Coast SAC;
- Humber Estuary SAC;
- Southern North Sea SAC;
- The Wash and North Norfolk Coast SAC;
- River Tweed SAC; and
- Tweed Estuary SAC.

Appendix 1: The impact pathways considered in this No Likely Significant Effects Report, which are referred to in the detailed screening matrices below.

Designation	Impact Pathways identified on the current evidence base	Presented in Screening Matrices as
Teesmouth and Cleveland Coast SPA / Ramsar	Visual and noise disturbance during construction, operation and decommissioning Atmospheric pollution during construction operation and decommissioning Deterioration in water quality during construction, operation and decommissioning Direct temporary habitat impact Coastal squeeze upon completion of the project Discharge of heated cooling water during operation Effects on foraging resources during construction and decommissioning	Visual and noise disturbance Atmospheric pollution Water quality Direct temporary habitat loss Coastal squeeze Discharge of heated cooling water Effects on foraging resources
North York Moors SAC	Atmospheric pollution during operation	Atmospheric pollution
North York Moors SPA	Atmospheric pollution during operation	Atmospheric pollution
Durham Coast SAC	Atmospheric pollution during operation	Atmospheric pollution
Northumbria Coast SPA / Ramsar	Atmospheric pollution during operation	Atmospheric pollution
Berwickshire and North Northumberland Coast SAC	Disturbance of functionally linked habitat during construction and decommissioning	Disturbance of functionally linked habitat
Humber Estuary SAC	Disturbance of functionally linked habitat during construction and decommissioning	Disturbance of functionally linked habitat
Southern North Sea SAC	Disturbance of functionally linked habitat during construction and decommissioning	Disturbance of functionally linked habitat
The Wash and North Norfolk Coast SAC	Disturbance of functionally linked habitat during construction and decommissioning	Disturbance of functionally linked habitat
River Tweed SAC	Disturbance of functionally linked habitat during construction and decommissioning	Disturbance of functionally linked habitat
Tweed Estuary SAC	Disturbance of functionally linked habitat during construction and decommissioning	Disturbance of functionally linked habitat

General matrix key:

✓ = Likely significant effect **cannot** be excluded

✖ = Likely significant effect **can** be excluded

C = Construction

O = Operation

APPENDIX B SCREENING MATRICES

Appendix 2: Detailed screening matrix assessing the qualifying features of the Teesmouth and Cleveland Coast SPA / Ramsar against the identified impact pathways during construction (C columns), operation (O columns) and decommissioning (D columns).

Name of European site and Designation: Teesmouth and Cleveland Coast SPA and Ramsar site																	
EU Code: UK9006061A																	
Distance to NSIP: Adjacent																	
Effect	**Visual and noise disturbance**			**Atmospheric pollution**			**Water Quality**			**Direct habitat loss**	**Effects on foraging resources**		**Discharge of heated cooling water**	**Coastal squeeze**	**In combination effects**		
Stage of Proposed Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**C**	**D**	**O**	**O**	**C**	**O**	**D**
Little tern *Sterna albifrons*	✓a	✕b	✓a	✕c	✓e	✕c	✓f	✓f	✓f	✓g	✕h	✕h	✕i	✕j	✓k	✓k	✓k
Common tern *Sterna hirundo*	✓a	✕b	✓a	✕c	✓e	✕c	✓f	✓f	✓f	✓g	✕h	✕h	✕i	✕j	✓k	✓k	✓k
Sandwich tern *Sterna sandvicensis*	✓a	✕b	✓a	✕d	✕e	✕d	✓f	✓f	✓f	✓g	✕h	✕h	✕i	✕j	✓k	✓k	✓k
Pied avocet *Recurvirostra avosetta*	✓a	✕b	✓a	✕c	✕e	✕c	✓f	✓f	✓f	✓g	✕h	✕h	✕i	✕j	✓k	✓k	✓k
Knot *Calidris canutus*	✓a	✕b	✓a	✕d	✕d	✕d	✓f	✓f	✓f	✓g	✕ h	✕ h	✕i	✕j	✓k	✓k	✓k

Name of European site and Designation: Teesmouth and Cleveland Coast SPA and Ramsar site																	
EU Code: UK9006061A																	
Distance to NSIP: Adjacent																	
Effect	**Visual and noise disturbance**			**Atmospheric pollution**			**Water Quality**			**Direct habitat loss**	**Effects on foraging resources**		**Discharge of heated cooling water**	**Coastal squeeze**	**In combination effects**		
Stage of Proposed Development	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**O**	**D**	**C**	**C**	**D**	**O**	**O**	**C**	**O**	**D**
Ruff *Calidris pugnax*	✓a	✕b	✓a	✕d	✕d	✕d	✓f	✓f	✓f	✓g	✓ h	✓ h	✕i	✕j	✓k	✓k	✓k
Redshank *Tringa totanus*	✓a	✕b	✓a	✕d	✕d	✕d	✓f	✓f	✓f	✓g	✓ h	✓ h	✕i	✕j	✓k	✓k	✓k
Waterbird assemblage	✓a	✕b	✓a	✕d	✕d	✕d	✓f	✓f	✓f	✓g	✓ h	✓ h	✕i	✕j	✓k	✓k	✓k

a. Paragraph 4.2.9 highlights that Likely Significant Effects of noise and visual disturbance on the SPA / Ramsar arising from construction for the Proposed Development cannot be excluded. Therefore, it is considered that appropriate assessment and mitigation measures will be required to avoid adverse effects on site integrity.

b. Paragraphs 4.3.1-4.3.3 discuss the potential for adverse noise disturbance effects of the operation of the Proposed Development on the SPA / Ramsar. Noise modelling predicts that the operation of the Proposed Development will result in a maximum noise level of 50-55 dB LAeq in the dune system of the Teesmouth and Cleveland Coast SPA / Ramsar (Figure 11-5 Rev 3 of ES Addendum, Document Ref 7.8.2) and below 50 dB at the closest pools used by redshank. This is below the existing daytime (56 dB LAeq) and in line with the night-time (47 dB LAeq) noise levels measured at location E1. Furthermore, it is considerably lower than the acceptable regular noise threshold of 70 dB (at receptor birds), which was identified in research undertaken for congregations of similar birds in the Humber Estuary. As such a conclusion of No likely significant effect can be drawn.

c. Little tern and common tern are the main nesting qualifying species that APIS identifies as sensitive to atmospheric pollution. However, paragraph 4.2.18 states that there are no tern nests within 200 m of the identified Affected Road Network of the Proposed Development. Likely Significant Effects of

atmospheric pollution on the terns can therefore be excluded. In addition to nesting terns, the SPA is designated for nesting avocet. APIS identifies that this species is sensitive to nitrogen deposition on its nesting habitat. However, paragraph 4.2.19 shows that the habitat associated with this species on APIS is littoral sediment, which has a relatively high nitrogen tolerance (a minimum critical load of 20 kgN/ha/yr). Total nitrogen deposition at the closest part of the SPA to the ARN is forecast to remain below this critical load even with the Proposed Development (being a maximum of c.11 kgN/ha/yr).

d. The qualifying species marked d are not sensitive to atmospheric nitrogen deposition according to APIS (Paragraph 4.2.14). While sandwich tern are sensitive to atmospheric pollution in principle, the SPA/Ramsar population is wintering only and therefore not sensitive to nitrogen deposition from the Proposed Development.

e. Operational site traffic has been screened out from the assessment because the Proposed Development will only involve 140 2-way daily traffic movements. However, paragraph 4.3.8 shows that nitrogen deposition resulting from the stacks of the Proposed Development will be above 1% of the Critical Load threshold for relevant Teesmouth and Cleveland Coast SPA / Ramsar habitats at the closest areas of the SPA/Ramsar site surrounding the plant. The 1% Critical Load limit is typically used by Natural England and the Environment Agency to denote potential significant atmospheric pollution impacts which require further analysis. Therefore, likely significant effects on the SPA/Ramsar site cannot be dismissed and appropriate assessment is required. While sandwich tern are sensitive to atmospheric pollution in principle, the SPA / Ramsar population is wintering only and therefore not sensitive to nitrogen deposition from the Proposed Development.

f. The Teesmouth and Cleveland Coast SPA / Ramsar (and SPA / Ramsar) is sensitive to negative changes in the water quality during the construction period. Paragraph 4.2.27 highlights that this particularly applies to toxic surface runoff, which is an issue requiring further consideration. A study on the ecological impact of changing water quality in the pools of the SPA / Ramsar is ongoing. This impact pathway is screened in for Appropriate Assessment. Paragraphs 4.3.14 and 4.3.16 also identify that Likely Significant Effects during the operational period cannot be excluded.

g. Paragraph 4.2.30 and 4.2.31 discuss the construction of the gas pipeline below the River Tees in relation to the foraging terns and the CO_2 export pipeline across Coatham Dunes (Teesmouth & Cleveland Coast SPA/Ramsar). However, the pipeline will be direct-drilled below the riverbed and the SPA/Ramsar and will therefore not result in the loss of habitat or any vibration of the water column. Paragraph 4.2.30 does, however, identify a Natural England concern over the risk of HDD collapse and the potential habitat loss impact on the overlying SPA/Ramsar site.

h. Paragraphs 4.2.47 to 4.2.49 discuss that the construction activities might lead to effects on the foraging resources of the wading birds and tern species. However, any effects of such activities is concluded to be very localised and effectively neutral on foraging resources with the exception of habitat loss, sediment process and invasive species spread impacts of the rock armour for the new or existing outfall. Effects of the rock armour are therefore taken forward to ~~from~~ Appropriate Assessment.

i. The qualifying species of the SPA / Ramsar are potentially sensitive to the indirect effects of erosion and wash-out as a result of the discharge of heated cooling water, which may lead to an increase in the turbidity and water temperature near the discharge point. However, modelling of the thermal plume resulting from discharge of heated cooling water has demonstrated that the plume is likely to be very localised (see paragraphs 4.3.19 – 4.3.22). Therefore, Likely Significant Effects can be excluded, and this impact pathway is screened out from Appropriate Assessment.

j. Paragraph 4.3.24 states that the Proposed Development lies on an existing brownfield site and therefore will not materially contribute to coastal squeeze. This impact pathway is screened out from Appropriate Assessment.

k. Since likely significant effects will arise from construction and decommissioning noise on all SPA/Ramsar features, from operational air quality impacts (on nesting terns and avocet only), and from construction and operational period water quality impacts on all SPA/Ramsar features, these will also operate in combination with other plans and projects. Operational noise impacts will not arise 'in combination' due to the noise levels from the proposed development being so far below the 70dB threshold and in line with baseline noise levels in the SPA/Ramsar. No 'in combination' coastal squeeze effect will occur as this impact pathway has been dismissed. No cooling water discharge erosion effect will occur 'in combination' due to the very localised extent of the plume from the Proposed Development being imperceptible within the context of the total area of subtidal SPA/Ramsar. Similarly, construction period effects on foraging resources will be temporary and very localised and thus be imperceptible within the context of the total area of open water foraging habitat available within the SPA/Ramsar.

Appendix 3: Detailed screening matrix assessing the qualifying features of the North York Moors SAC against the identified impact pathway during operation (O column) and decommissioning (D column).

Name of European site and Designation: North York Moors SAC

EU Code: UK0030228		
Distance to NSIP: 12.7km		
Effect	**Atmospheric pollution**	**In Combination Effects**
Stage of Proposed Development	**O**	**O**
Northern Atlantic wet heaths with *Erica tetralix*	✓a	✓c
European dry heaths	✓a	✓c
Blanket bogs	✕b	✕d

a. Paragraph 4.3.9 indicates that as modelled for the PEIR the operation of the PCC site was forecast to result in a 0.1-0.2 kg N/ha/yr deposition on both the wet heaths and dry heaths habitat components in the North York Moors SAC. Assuming the higher end of the deposition range of 0.2 kg N/ha/yr, this would contribute 2% of the critical nitrogen load for these habitats, which is in excess of the 1% process contribution that is used to dismiss atmospheric pollution impacts. Therefore, this impact pathway is screened in for Appropriate Assessment, where the updated modelling and process improvements will be taken into account.

b. Paragraph 4.3.9 also highlights that the operational nitrogen deposition from the PCC site would not result in a material increase in nitrogen deposition on the most sensitive qualifying habitat (blanket bog) of the SAC. Therefore, this impact pathway is screened out from Appropriate Assessment.

c. Since likely significant effects will arise from operational air quality impacts (on heathland only), these will also operate in combination with other plans and projects.

d. Since blanket bog is beyond the operational air quality zone of influence of the scheme no in combination effect will arise.

Appendix 4: Detailed screening matrix assessing the qualifying features of the North York Moors SPA against the identified impact pathway during operation (O column).

Name of European site and Designation: North York Moors SPA

EU Code: UK9006161		
Distance to NSIP: 12.7km		
Effect	**Atmospheric pollution**	**In Combination Effects**
Stage of Proposed Development	**O**	**O**
Merlin *Falco columbianus*	✓a	✓b
Golden plover *Pluvialis apricaria*	✓a	✓b

a. In the breeding season merlin mainly rely on dwarf shrub heath (identified as having a critical nitrogen load of 10-20 kg N/ha/yr on APIS) as may golden plover to a lesser extent. Based on the initial air dispersion modelling (paragraph 4.3.9) undertaken for the PEIR, the Proposed Development would result in nitrogen deposition of approx. 2% of the annual critical load on the merlin's supporting habitat. This is in excess of the 1% critical load standard used to dismiss atmospheric pollution impacts as negligible. Therefore, this impact pathway is screened in for Appropriate Assessment where the updated modelling and process improvements will be taken into account.

b. Since likely significant effects will arise from operational air quality impacts on heathland only, these will also operate in combination with other plans and projects.

Appendix 5: Detailed screening matrix assessing the qualifying features of the Durham Coast SAC against the identified impact pathways during operation (O column).

Name of European site and Designation: Durham Coast SAC

EU Code: UK0030140		
Distance to NSIP: 14.5km		
Effect	**Atmospheric pollution**	**In Combination Effects**
Stage of Proposed Development	**O**	**O**
Vegetated sea cliffs of the Atlantic and Baltic Coasts	✕a	✕b

a. Paragraph 4.3.10 highlights that the qualifying feature of the Durham Coast SAC is not sensitive to atmospheric nitrogen or acid deposition. The site is therefore screened out from Appropriate Assessment.

b. Since the qualifying feature is not vulnerable to atmospheric pollution no in combination effect will arise

Appendix 6: Detailed screening matrix assessing the qualifying features of the Northumbria Coast SPA / Ramsar against the identified impact pathways during operation (O).

Name of European site and Designation: Northumbria Coast SPA/Ramsar				
EU Code: UK9006131				
Distance to NSIP: 7.6km				
Effect	**Atmospheric pollution**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Purple sandpiper *Calidris maritima*	✕a	✕a	✕b	✕b
Ruddy turnstone *Arenaria interpres*	✕a	✕a	✕b	✕b
Little tern *Sterna albifrons*	✕a	✕a	✕b	✕b

a. Paragraph 4.3.10 details that the nesting little tern are the only qualifying feature of the Northumbria Coast SPA / Ramsar that is sensitive to atmospheric pollution. However, the tern nesting locations lie beyond the area affected by nitrogen deposition from the Proposed Development.

b. Since the only sensitive interest feature lies beyond the air quality impact zone of the Proposed Development no in combination effect will arise.

Appendix 7: Detailed screening matrix assessing the qualifying features of the Berwickshire and North Northumberland Coast SAC against the identified impact pathways during construction (C column) and decommissioning (D column).

Name of European site and Designation: Berwickshire & North Northumberland Coast SAC

EU Code: UK0017072				
Distance to NSIP: 87km				
Effect	**Disturbance in functionally linked habitat**		**In Combination Effects**	**In Combination Effects**
Stage of Proposed Development	**C**	**D**	**C**	**D**
Mudflats and sandflats not covered by seawater at low tide	N/A	N/A	N/A	N/A
Large shallow inlets and bays	N/A	N/A	N/A	N/A
Reefs	N/A	N/A	N/A	N/A
Submerged or partially submerged sea caves	N/A	N/A	N/A	N/A
Grey seal *Halichoerus grypus*	✕a	✕a	✕b	✕b

a. Paragraph 4.2.36 discusses that grey seal use functionally linked habitat beyond designated site boundaries. However, tagging studies have shown no significant migration between the four estuarine / marine SACs identified as potentially relevant to the Proposed Development. Therefore, this species is screened out from Appropriate Assessment.

b. Since there is no evidence of a connection between the grey seal population of the area around the Proposed Development, and the SAC population, no in combination effect will arise.

Appendix 8: Detailed screening matrix assessing the qualifying features of the Humber Estuary SAC against the identified impact pathway during construction (C column) and decommissioning (D column).

Name of European site and Designation: Humber Estuary SAC

EU Code: UK0030170

Distance to NSIP: 110km

Effect	**Disturbance of functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Estuaries	N/A	N/A	N/A	N/A
Mudflats and sandflats not covered by seawater at low tide	N/A	N/A	N/A	N/A
Sandbanks which are slightly covered by sea water all the time	N/A	N/A	N/A	N/A
Coastal lagoons	N/A	N/A	N/A	N/A
Salicornia and other annuals colonizing mud and sand	N/A	N/A	N/A	N/A

Name of European site and Designation: Humber Estuary SAC

EU Code: UK0030170

Distance to NSIP: 110km

Effect	**Disturbance of functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	N/A	N/A	N/A	N/A
Embryonic shifting dunes	N/A	N/A	N/A	N/A
Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")	N/A	N/A	N/A	N/A
Fixed coastal dunes with herbaceous vegetation ("grey dune")	N/A	N/A	N/A	N/A

Name of European site and Designation: Humber Estuary SAC

EU Code: UK0030170

Distance to NSIP: 110km

Effect	**Disturbance of functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Dunes with *Hippopha rhamnoides*	N/A	N/A	N/A	N/A
Sea lamprey *Petromyzon marinus*	✕a	✕a	✕d	✕d
River lamprey *Lampetra fluviatilis*	✕b	✕b	✕d	✕d
Grey seal *Halichoerus grypus*	✕c	✕c	✕d	✕d

a. Paragraph 4.2.45 addresses the potential of the Proposed Development to result in disturbance of migratory routes for fish. However, the proposals do not involve construction or operation activities in the marine environment that could affect the migratory fish. Therefore, this species is screened out from Appropriate Assessment.

b. While river lamprey might use functionally linked habitat beyond the designated site boundary, they are not migratory and there will not be Likely Significant Effects of the Proposed Development due to its long distance to the Humber Estuary SAC.

c. Paragraph 4.2.36 discusses that grey seal use functionally linked habitat beyond designated site boundaries. However, tagging studies have shown no significant grey seal migration between the four estuarine / marine SACs identified as potentially relevant to the Proposed Development. Therefore, this species is screened out from Appropriate Assessment.

d. Since there is effectively no impact pathway connecting the Proposed Development to the Humber Estuary SAC, no in combination effect will arise.

Appendix 9: Detailed screening matrix assessing the qualifying features of the Southern North Sea SAC against the identified impact pathway during construction (C column) and decommissioning (D column).

Name of European site and Designation: Southern North Sea SAC				
EU Code: UK0030395				
Distance to NSIP: 102km				
Effect	**Disturbance in functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Harbour porpoise *Phocoena phocoena*	✓a	✓a	✓b	✓b

a. Paragraphs 4.2.38 **Error! Reference source not found.** to 4.2.43 discuss that harbour porpoise use habitat surrounding the Proposed Development and that they are sensitive to underwater sound disturbance. Given that harbour porpoise use habitat around the Proposed Development and the functional linkage to the Southern North Sea SAC, this impact pathway is screened in for Appropriate Assessment. Paragraph 4.2.44 makes it clear that no impact will arise due to the drilling of the CO_2 gathering network below the River Tees as this will not be in the water column.

b. Since a likely significant effect will arise alone, it cannot be dismissed 'in combination'

Appendix 10: Detailed screening matrix assessing the qualifying features of The Wash and North Norfolk Coast SAC against the identified impact pathway during construction (C column) and decommissioning (D column).

Name of European site and Designation: The Wash and North Norfolk Coast SAC				
EU Code: UK0017075				
Distance to NSIP: 174km				
Effect	**Disturbance in functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Sandbanks which are slightly covered by sea water all the time	N/A	N/A	N/A	N/A
Mudflats and sandflats not covered by seawater at low tide	N/A	N/A	N/A	N/A
Large shallow inlets and bays	N/A	N/A	N/A	N/A
Reefs	N/A	N/A	N/A	N/A
Salicornia and other annuals colonizing mud and sand	N/A	N/A	N/A	N/A

Name of European site and Designation: The Wash and North Norfolk Coast SAC				
EU Code: UK0017075				
Distance to NSIP: 174km				
Effect	**Disturbance in functionally linked habitat**		**In Combination Effects**	
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	N/A	N/A	N/A	N/A
Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticose*)	N/A	N/A	N/A	N/A
Coastal lagoons	N/A	N/A	N/A	N/A
Harbour seal *Phoca vitulina*	✕a	✕a	✕c	✕c
Otter *Lutra lutra*	✕b	✕b	✕c	✕c

a. Paragraph 4.2.37 discusses that harbour seal use functionally linked habitat beyond designated site boundaries. However, the area surrounding the Proposed Development is not considered to be heavily used in the context of the wider North Sea harbour seal population. Therefore, this species is screened out from Appropriate Assessment.

b. While otter might use functionally linked habitat beyond the designated site boundary, there will not be Likely Significant Effects of the Proposed Development due to its long distance to The Wash and North Norfolk Coast SAC.

c. Since the area around the Proposed Development is of negligible importance to The Wash and North Norfolk Coast harbour seal population, no in combination effects will arise.

Appendix 11: Detailed screening matrix assessing the qualifying features of the River Tweed SAC against the identified impact pathway during construction (C column) and decommissioning (D column).

Name of European site and Designation: River Tweed SAC				
EU Code: UK0012691				
Distance to NSIP: 138km				
Effect	**Disturbance in functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	N/A	N/A	N/A	N/A
Atlantic salmon *Salmo salar*	✕a	✕a	✕c	✕c
Otter *Lutra lutra*	✕b	✕b	✕c	✕c
Sea lamprey *Petromyzon marinus*	✕a	✕a	✕c	✕c

Name of European site and Designation: River Tweed SAC				
EU Code: UK0012691				
Distance to NSIP: 138km				
Effect	**Disturbance in functionally linked habitat**		**In Combination Effects**	
Brook lamprey *Lampetra planeri*	✕b	✕b	✕c	✕c
River lamprey *Lampetra fluviatilis*	✕b	✕b	✕c	✕c

a. Paragraph 4.2.45 addresses the potential of the Proposed Development to result in disturbance of migratory routes for fish. However, the proposals do not involve construction or operation activities in the marine environment that could affect the migratory fish. Therefore, these species are screened out from Appropriate Assessment.

b. While otter, brook lamprey and river lamprey might use functionally linked habitat beyond the designated site boundary, they are not migratory and there will not be Likely Significant Effects of the Proposed Development due to its long distance to the River Tweed SAC.

c. Since there is no impact pathway to affect the interest features of the SAC no in combination effects will arise.

Appendix 12: Detailed screening matrix assessing the qualifying features of the Tweed Estuary SAC against the identified impact pathways during construction (C column) and decommissioning (D column).

Name of European site and Designation: Tweed Estuary SAC				
EU Code: UK0030292				
Distance to NSIP: 137km				
Effect	**Disturbance of functionally linked habitat**		**In Combination Effects**	
Stage of Proposed Development	**C**	**D**	**C**	**D**
Estuaries	N/A	N/A	N/A	N/A
Mudflats and sandflats not covered by seawater at low tide	N/A	N/A	N/A	N/A
Sea lamprey *Petromyzon marinus*	✕a	✕a	✕c	✕c
River lamprey *Lampetra fluviatilis*	✕b	✕b	✕c	✕c

a. Paragraph 4.2.45 addresses the potential of the Proposed Development to result in disturbance of migratory routes for fish. However, the proposals do not involve construction or operation activities in the marine environment that could affect the migratory fish. Therefore, this species is screened out from Appropriate Assessment.

b. While river lamprey might use functionally linked habitat beyond the designated site boundary, they are not migratory and there will not be Likely Significant Effects of the Proposed Development due to its long distance to the Tweed Estuary SAC.

c. Since there is no impact pathway to affect the interest features of the SAC no in combination effects will arise.

APPENDIX C APPROPRIATE ASSESSMENT MATRICES

Appendix 13: Detailed matrix assessing the qualifying species of the Teesmouth and Cleveland Coast SPA / Ramsar against the identified impact pathways during construction (C columns), operation (O columns) and decommissioning (D columns).

Name of European site and Designation: Teesmouth & Cleveland Coast SPA/Ramsar

EU Code: UK9006061A												
Distance to NSIP: Adjacent												
Effect	**Visual and noise disturbance**		**Atmospheric pollution**	**Direct habitat loss**	**Effects on foraging resources**		**Water Quality**			**In Combination Effects**		
Stage of Proposed Development	**C**	**D**	**O**	**C**	**C**	**D**	**C**	**O**	**D**	**C**	**O**	**D**
Little tern *Sterna albifrons*	×a	×a	×b	×f	×e	×e	×c	×c	×c	×d	×d	×d
Common tern *Sterna hirundo*	×a	×a	×b	×f	×e	×e	×c	×c	×c	×d	×d	×d
Sandwich tern *Sterna sandvicensis*	×a	×a	NA	×f	×e	×e	×c	×c	×c	×d	×d	×d
Pied avocet *Recurvirostra avosetta*	×a	×a	×b	×f	×e	×e	×c	×c	×c	×d	×d	×d
Knot *Calidris canutus*	×a	×a	NA	×f	×e	×e	×c	×c	×c	×d	×d	×d
Ruff *Calidris pugnax*	×a	×a	NA	×f	×e	×e	×c	×c	×c	×d	×d	×d
Redshank *Tringa totanus*	×a	×a	NA	×f	×e	×e	×c	×c	×c	×d	×d	×d
Waterbird assemblage	×a	×a	NA	×f	×e	×e	×c	×c	×c	×d	×d	×d

a. Paragraphs 6.1.7 (bored piling at the PCC Site~~),~~) and 6.1.~~11~~ 9 (HDD for CO_2 export pipeline~~) and 6.1.15 (CO_2 gathering network~~) discuss potential noise impacts on the Teesmouth and Cleveland Coast SPA / Ramsar during the construction period. Adverse noise disturbance effects on integrity could be excluded. Paragraph 6.1.7 highlights that the Coatham Dunes units of the Teesmouth and Cleveland Coast SSSI would be subject to L_{Aeq} ~~-~~of approx. 65-70dB at the northern edge of the Proposed Development during piling for the CO_2 export pipeline. Only a small section of the SPA / Ramsar would fall within this zone (approximately 5ha), the entire area falls below the 70dB disturbance threshold identified as being significant for the SPA/Ramsar and the nearest historic pool for wintering redshank is 100m into Coatham Dunes. Paragraph 6.1.~~9~~ 10 confirms that noise levels from HDD for the CO_2 export pipeline would ~~be~~ fall to 69 dB (i.e. below 70 dB as agreed with Natural England) at 65m. The nearest pool (significantly overgrown) is Pond 13, approximately 100m from

the closest point of HDD. The nearest pond that is still open and available for use by redshank is Pond 14, 150m from the closest point of HDD. Moreover, the inclusion of a noise barrier would reduce noise levels to 69 dB just 24m from the nearest point of HDD such that by 90m from the works the noise level due to the HDD would be a relatively quiet 58 dB. Visual disturbance also cannot be dismissed without mitigation. Paragraph 6.1.15 lists the specific noise and visual mitigation measures to be implemented.

b. Paragraphs 6.1.~~30~~ 25 – 6.1.~~34~~ 38 discuss the potential impacts of operational nitrogen deposition on avocet and tern nesting sites. With the peak nitrogen deposition to occur on sand- and mudflats in the Coatham Sands part of the SSSI, the assessment showed that the nitrogen dose from the Proposed Development is likely to contribute 0.2% of the annual Critical Load at Saltholme Reserve (comprising the main common tern and avocet nesting sites) and 0.5% of the annual Critical Load at little tern nesting sites. Both modelled doses are well below the 1% of the CL threshold, implying that there will be no adverse effects on site integrity of the Proposed Development alone. An assessment (paragraphs 7.1.3 to 7.1.6) of potential in-combination effects with the Redcar Energy Centre (up to 8.6% of the CL) also concluded there would be no adverse effect on the integrity of the SPA/Ramsar.

c. Paragraph 6.1.~~35~~ 39 highlights that water quality impacts could arise due to accidental spillages or unsafe materials storage during the construction and operational period. In particular, the PCC Site lies directly adjacent to the Coatham Sands part of the SSSI and toxic or non-toxic pollutants could easily reach the pools in the dune system. Mitigation measures are identified in paragraphs 6.1.~~42~~ 46 to 6.1.~~44~~ 48~~and 6.1.54~~, including the preparation of a Construction Environmental Management Plan (CEMP), minimisation of surface / groundwater flow into the pools of Coatham Sands during the construction of the CO_2 export pipeline and a Water Management Plan (WMP). Considering these mitigation measures there will be no adverse effects on the integrity of the SPA / Ramsar regarding water quality, both in the construction and operational period. Paragraphs 6.1.50 to 6.1.53~~4~~ discuss operational nutrient inputs into the SPA/Ramsar but conclude that there will be no inputs to the estuarine part of the SPA/Ramsar and inputs to Tees Bay will not affect the ability of the site to achieve its conservation objectives for foraging terns, in line with Natural England's advice of July 2022 that only the estuary is failing due to excess nitrogen.

d. Since construction noise levels will fall well below the 70 dB disturbance threshold with mitigation in place, and no other projects are identified to be undergoing construction (or decommissioning) at the same time as the Proposed Development and will also affect the same parts of the SPA / Ramsar site, no in combination effect on integrity will arise. For operational nitrogen deposition, an assessment (paragraphs 7.1.3 to 7.1.6) of potential in-combination effects with the Redcar Energy Centre (up to 8.6% of the CL) also concluded there would be no adverse effect on the integrity of the SPA/Ramsar. For water quality, the mitigation measures will ensure that no pollution occurs and thus there is no scope for 'in combination' effects on integrity of the SPA / Ramsar.

e. Paragraphs 6.1.~~17~~ 21 to 6.1.~~20~~ 24 confirm that there will be no adverse effect on the integrity of the SPA/Ramsar site from rock armour, due to a combination of the low current presence of invasive species in Tees Bay, the small and isolated nature of the rock armour as a colonisation source, the fact that the rock armour is a very low percentage of the overall area of sandflat habitat available for prey species for SPA birds and steps taken in installing the rock armour to ensure it is clean and increase the likelihood of colonisation by native species. These paragraphs also demonstrate the rock armour will have no material effect on coastal processes due to a combination of its small size and circular footprint and detailed design measures such as ensuring an elevation no more than 1m above the seabed.

f. Paragraphs 6.1.55 and 6.1.56 confirms that the risk of HDD collapse is low and explains the integral features of HDD design and monitoring that will minimise the risk and ensure no adverse effects on integrity will arise. It also references the emergency clean up plan that has been produced and would be implemented in the very unlikely event it is required.

Appendix 14: Detailed matrix assessing the qualifying habitats of the North York Moors SAC against the identified impact pathway during operation (O column).

Name of European site and Designation: North York Moors SAC

EU Code: UK0030228		
Distance to NSIP: 12.7km		
Effect	**Atmospheric pollution**	**In Combination Effects**
Stage of Proposed Development	**O**	**O**
Northern Atlantic wet heaths with *Erica tetralix*	✕a	✕b
European dry heaths	✕a	✕b
Blanket bogs	NA	NA

a. Paragraph 6.2.1 detailed that the operational phase of the Proposed Development may lead to significant nitrogen deposition in the SAC. For the PIER it was determined that the Proposed Development would lead to a nitrogen deposition dose of between 0.1 and 0.2 kg N/ha/yr, amounting to approx. 1-2% of the annual Critical Load for heathland habitats. However, the number of CCGT trains (and stacks) have since been reduced and process technology improved (see paragraph 6.2.2). Updated isopleths for nitrogen deposition, based on the new parameters, are being modelled. It is anticipated that nitrogen deposition within the SAC will be well below the 1% Critical Load threshold.

b. Since the effect due to the scheme will be well below the threshold of triviality (1% of the critical load) and no other schemes have been identified that would be affecting the same part of the SAC potential for 'in combination' effects exists.

Appendix 15: Detailed matrix assessing the qualifying features of the North York Moors SPA against the identified impact pathway during operation (O column).

Name of European site and Designation: North York Moors SPA

EU Code: UK9006161		
Distance to NSIP: 12.7km		
Effect	**Atmospheric pollution**	**In combination effects**
Stage of Proposed Development	**O**	**O**
Merlin *Falco columbianus*	✕a	✕b
Golden plover *Pluvialis apricaria*	✕a	✕b

a. While the merlin and golden plover are not directly sensitive to nitrogen deposition, it critically depends on heathland habitat for its life cycle. Paragraph 6.2.1 detailed that the operational phase of the Proposed Development may lead to significant nitrogen deposition in the SPA (which overlaps with the SAC). For the PIER it was determined that the Proposed Development would lead to a nitrogen deposition dose of between 0.1 and 0.2 kg N/ha/yr, amounting to approx. 1-2% of the annual Critical Load for heathland habitats. However, the number of CCGT trains (and stacks) have since been reduced and process technology improved (see paragraph 6.2.2). Updated isopleths for nitrogen deposition, based on the new parameters, are being modelled. It is anticipated that nitrogen deposition within the SPA will be well below the 1% Critical Load threshold.

b. Since the effect due to the scheme will be well below the threshold of triviality (1% of the critical load) and no other schemes have been identified that would be affecting the same part of the SAC potential for 'in combination' effects exists.

Appendix 16: Detailed matrix assessing the qualifying features of the Southern North Sea SAC against the identified impact pathway during construction (C column).

Name of European site and Designation: Southern North Sea SAC

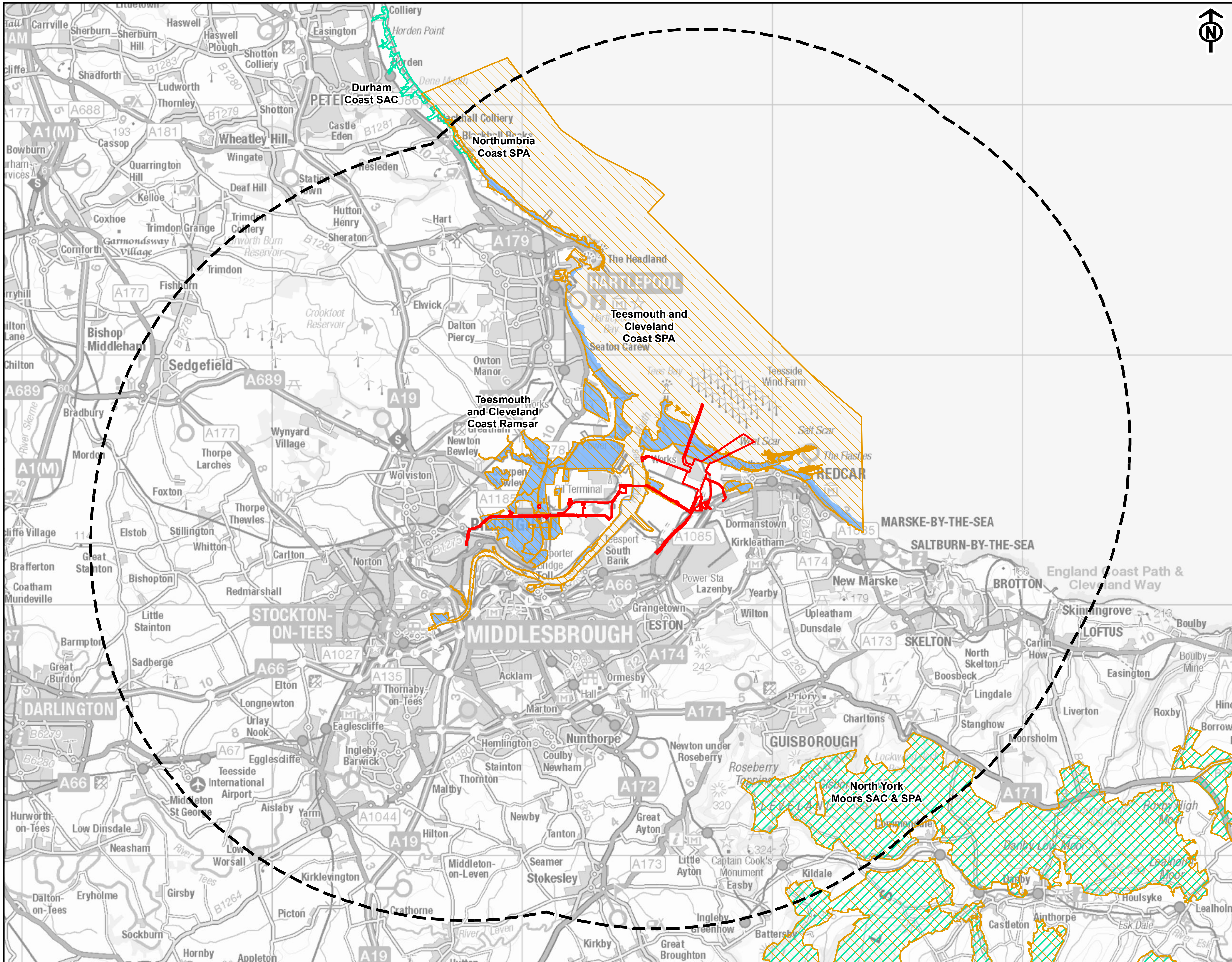
EU Code: UK0030395		
Distance to NSIP: 102km		
Effect	**Disturbance in functionally linked habitat**	**In Combination Effects**
Stage of Proposed Development	**C**	**C**
Harbour porpoise *Phocoena phocoena*	✕a	✕b

a. Paragraph 6.3.1 detailed that the Proposed Development (specifically UXO detonations) could lead to noise disturbance of harbour porpoise in functionally linked habitat (animals from the Southern North Sea SAC reportedly use the Tees Bay). However, given the relatively small extent of marine works, the distance between the Proposed Development and the Southern North Sea SAC, the number of UXO detonations, if needed, is likely to be very low. Furthermore, there are a range of mitigation measures to avoid impacts on marine life, including harbour porpoise (see paragraph 6.3.5-6.3.6) presented. Given this, it is concluded that the Proposed Development will not lead to adverse effects on the integrity of the Southern North Sea SAC regarding disturbance in functionally linked habitat.

b. Mitigation measures have been identified which will ensure no mortality or significant disturbance of harbour porpoise arises, and taking into account the small likely need for UXO detonations, no in combination effect on integrity will arise.

APPENDIX D DESIGNATED SITE FIGURES

Project Management Initials: RL Designer: LC Checked: LK Approved: IC



Scale @ A3 1:150,000

THE NET ZERO TEESSIDE ORDER 20[XX]

REGULATION 5(2)(G) – INFRASTRUCTURE PLANNING (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURES) REGULATIONS 2009

DOCUMENT REF. 5.13

AECOM

PROJECT

NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS

NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Site Boundary
- 15km Study Area
- Special Protection Area
- Special Area of Conservation
- Ramsar

TITLE

FIGURE 1
RELEVANT EUROPEAN SITES WITHIN 15KM
DOCUMEN T REF. 5.13

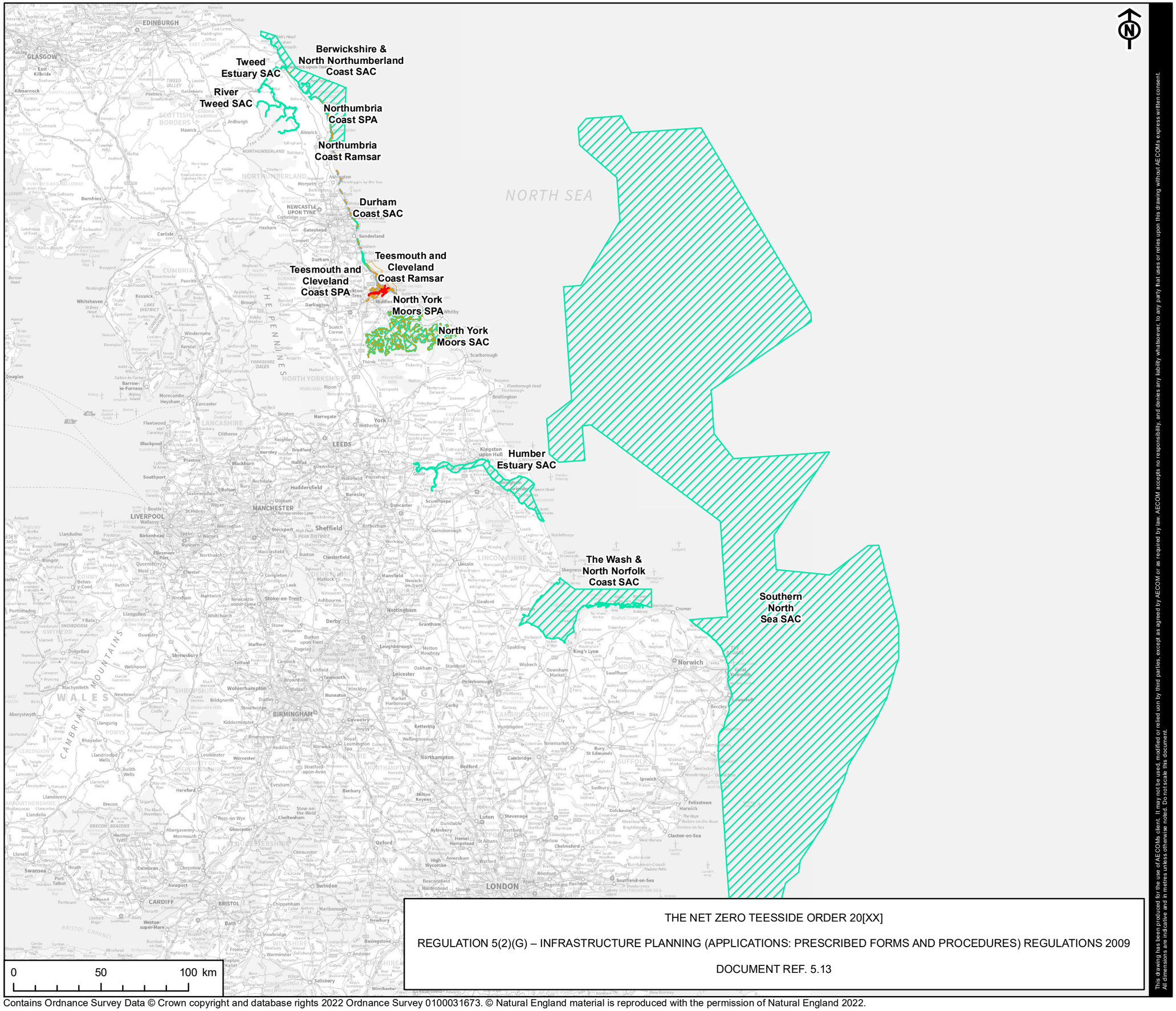
REFERENCE

NZT_AUGUST22_DCO_5.13_1_v4

SHEET NUMBER | DATE

1 of 1 | AUGUST 2022

Project Management Initials: RL Designer: LC Checked: LK Approved: IC



Scale @ A3 1:2,000,000

0 50 100 km

THE NET ZERO TEESSIDE ORDER 20[XX]

REGULATION 5(2)(G) – INFRASTRUCTURE PLANNING (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURES) REGULATIONS 2009

DOCUMENT REF. 5.13

AECOM

PROJECT

NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS

NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Site Boundary
- Special Protection Area
- Special Area of Conservation
- Ramsar

TITLE

FIGURE 2
DESIGNATED SITES
DOCUMEN T REF. 5.13

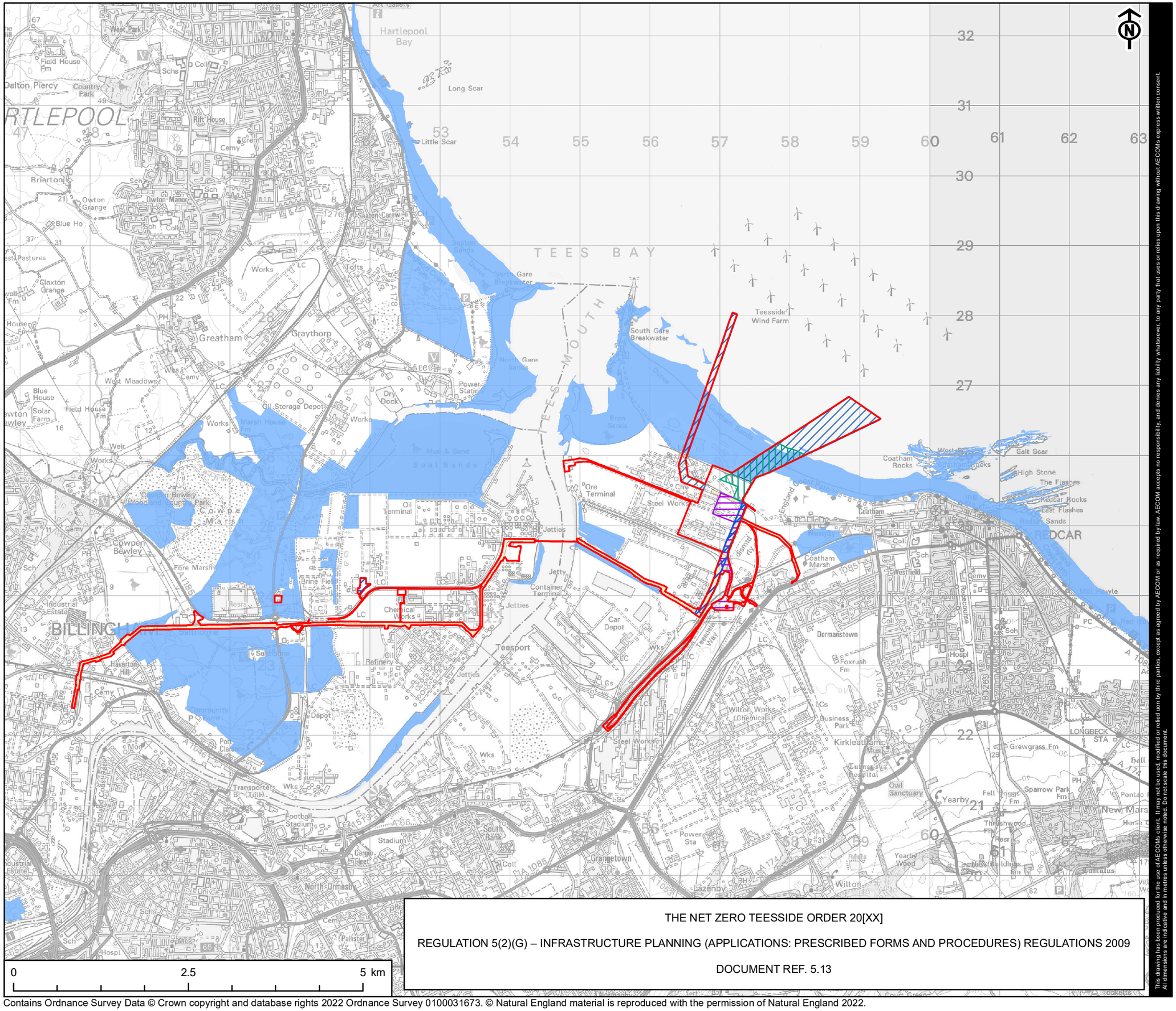
REFERENCE

NZT_AUGUST22_DCO_5.13_2_v4

SHEET NUMBER: 1 of 1

DATE: AUGUST 2022

Project Management Initials: RL Designer: LC Checked: AR Approved: RW



THE NET ZERO TEESSIDE ORDER 20[XX]

REGULATION 5(2)(G) – INFRASTRUCTURE PLANNING (APPLICATIONS: PRESCRIBED FORMS AND PROCEDURES) REGULATIONS 2009

DOCUMENT REF. 5.13

AECOM

PROJECT

NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS

NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Site Boundary
- Ramsar
- CO_2 Export Pipeline
- CO_2 Gathering Network
- Natural Gas Connection Corridor
- Electrical Connection Corridor
- Water Supply Connection
- Water Discharge Corridor

TITLE

FIGURE 3
LOCATION OF TEESMOUTH AND CLEVELAND COAST RAMSAR IN RESPECT OF THE PROPOSED DEVELOPMENT
DOCUMENT REF. 5.13

REFERENCE

NZT_AUGUST22_DCO_5.13_3_v4

SHEET NUMBER

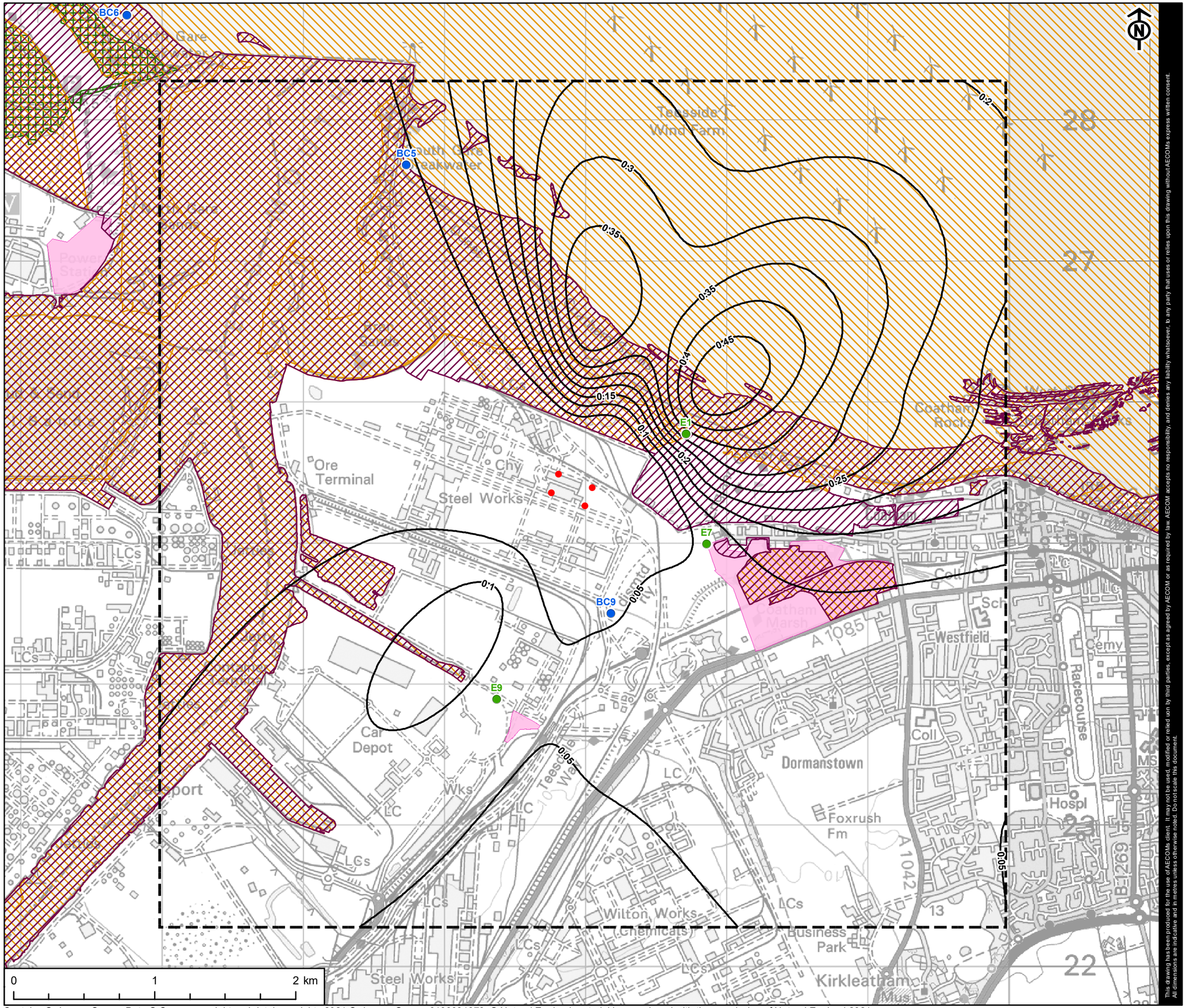
1 of 1

DATE

AUGUST 2022

APPENDIX E RELEVANT ES FIGURES

Project Management Initials: RL Designer: LC Checked: AR Approved: HW



Scale @ A3 1:25,000

0 1 2 km

AECOM

PROJECT
NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS
NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Study Area
- Nutrient N Deposition (kg N/ha/yr)
- Emission Source
- Bird Colony
- Ecological Receptor
  - E1 - Teesmouth and Cleveland Coast Ramsar, SPA, SSSI
  - E7 - Coatham Marsh
  - E9 - Eston Pumping Station
- Site of Special Scientific Interest
- Special Protection Area
- Local Nature Reserve
- Local Wildlife Site

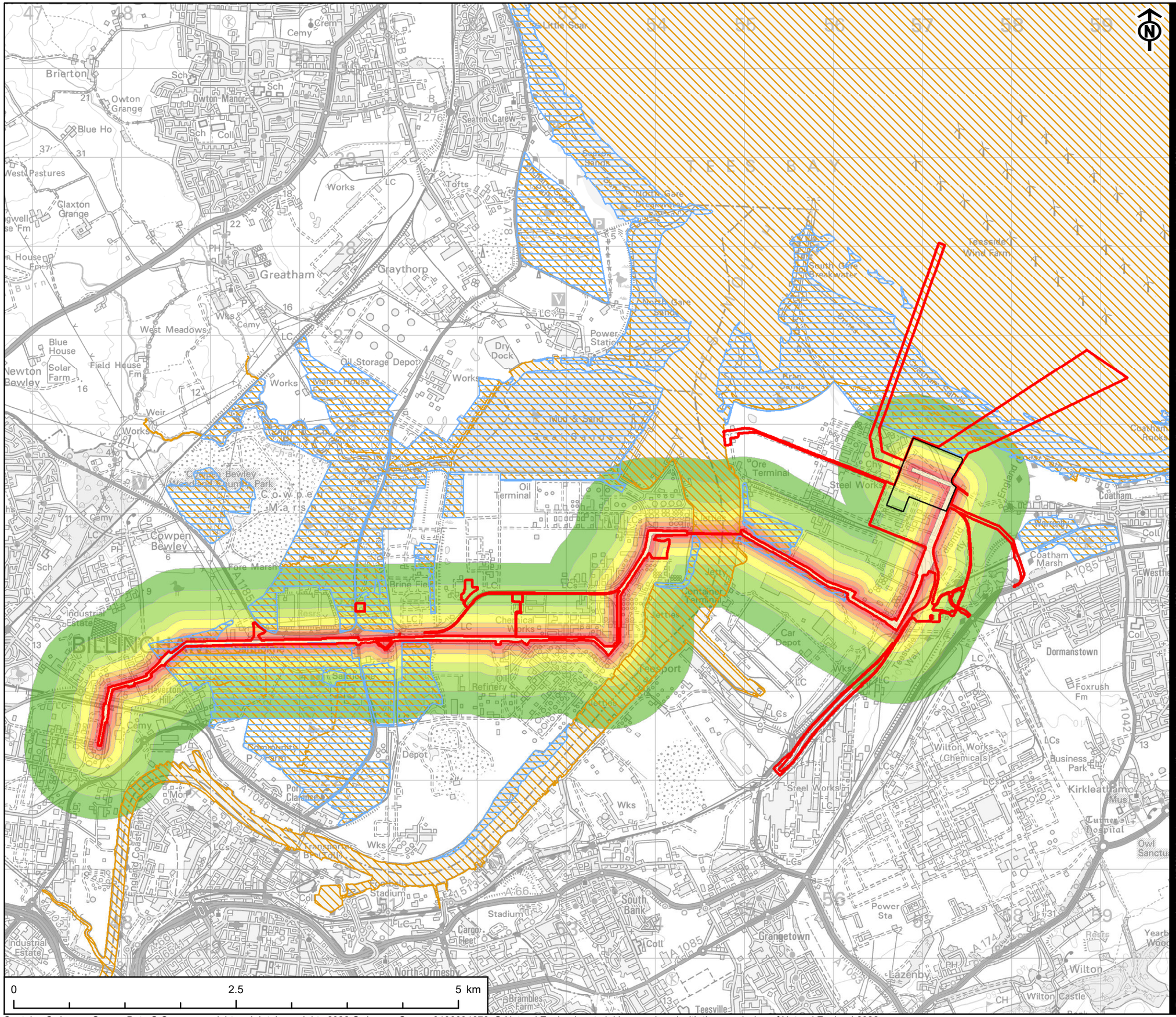
TITLE
FIGURE 8-9
NUTRIENT NITROGEN DEPOSITION (kg N/ha/yr) FROM THE OPERATIONAL DEVELOPMENT
2015 METEOROLOGICAL YEAR

REFERENCE
NZT_210430_ES_8-9_v2

SHEET NUMBER
1 of 1

DATE
30/04/2021

Project Management Initials: RL Designer: LC Checked: AR Approved: SE



Scale @ A3 1:40,000

AECOM

PROJECT

NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS

NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Site Boundary
- Power, Capture and Compressor Site
- CO_2 Gathering Network
- Ramsar Site
- Special Protection Area

CO_2 Gathering Network - Noise Distance Bands

Distance (m) - Level $L_{Aeq,\,T}$ (dB) - Significance

- 50 - 69 - IECS Receptor Value
- 100 - 62 - 10 dB above Saltholme measured daytime $L_{Aeq,\,T}$
- 150 - 58 - 10 dB above Bran Sands measured daytime $L_{Aeq,\,T}$
- 250 - 55 - 10 dB above Coatham measured daytime $L_{Aeq,\,T}$
- 350 - 52 - Equal to Saltholme measured daytime $L_{Aeq,\,T}$
- 575 - 48 - Equal to Bran Sands measured daytime $L_{Aeq,\,T}$
- 825 - 45 - Equal to Coatham measured daytime $L_{Aeq,\,T}$

NOTE:
The noise levels predicted are based upon the methodologies outlined in:
- Chapter 11:Noise and Vibration
- Appendix 11A: Construction Noise Assessment Methodology

Details of assessment methodologies for assessing noise impacts on ecological receptors contained in Chapter 15: Ornithology and the Habitats Regulations Assessment

TITLE

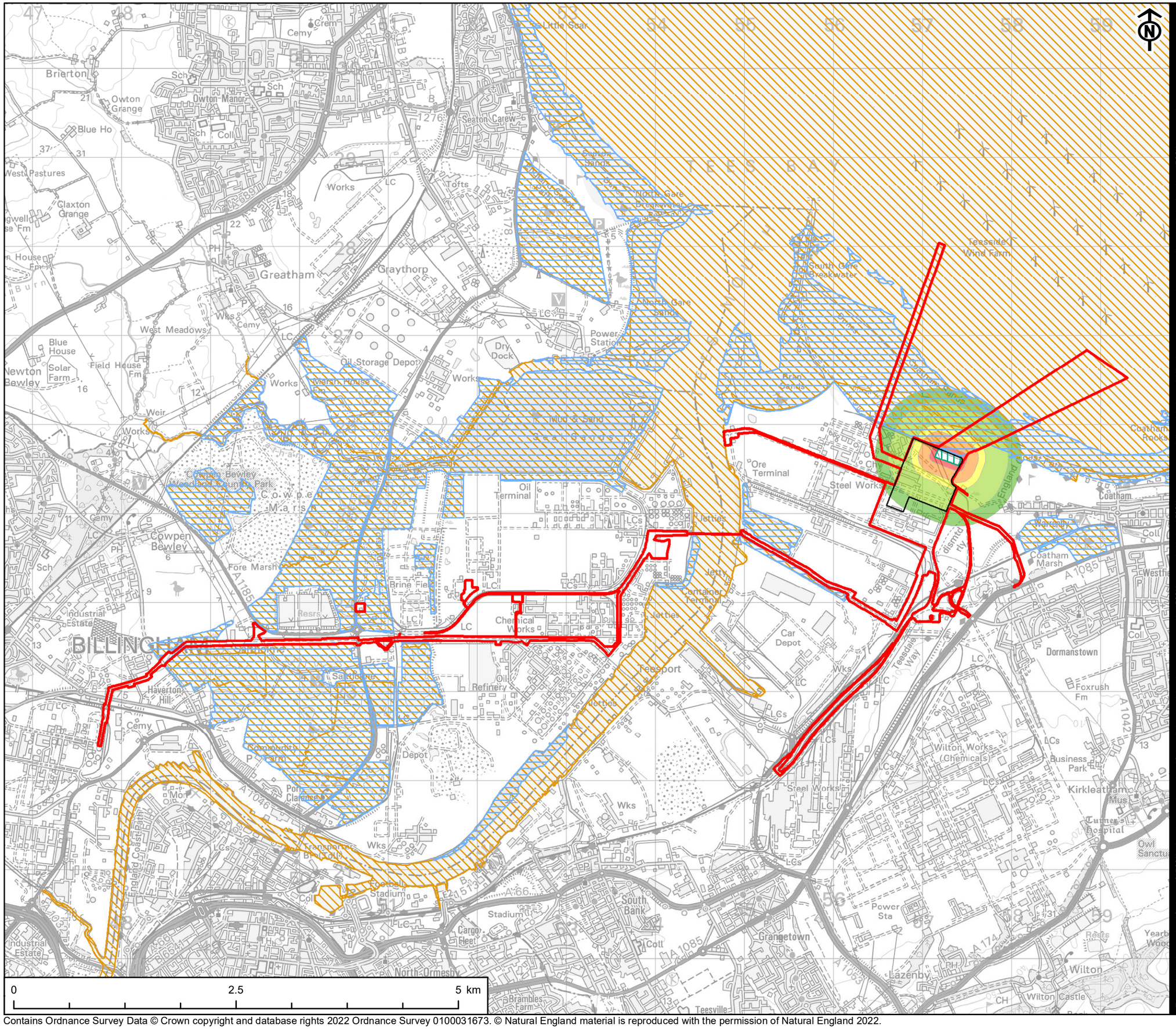
FIGURE 11-3
NOISE DISTANCE BANDS
CO_2 GATHERING NETWORK - CONSTRUCTION

REFERENCE

NZT_220818_ES_11-3_v8

SHEET NUMBER	DATE
1 of 1	18/08/22

Project Management Initials: RL Designer: LC Checked: AR Approved: SE



Scale @ A3 1:40,000

AECOM

PROJECT

NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS

NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Site Boundary
- Power, Capture and Compressor Site
- CO_2 Export Pipeline - HDD Area
- Ramsar Site
- Special Protection Area

CO_2 Export Pipeline - HDD Area - Noise Distance Bands

Distance (m) - Level $L_{Aeq,\ T}$ (dB) -

- 65 - 69 - IECS Receptor Value
- 190 - 58 - 10 dB above Bran Sands measured daytime $L_{Aeq,\ T}$
- 270 - 55 - 10 dB above Coatham measured daytime $L_{Aeq,\ T}$
- 525 - 48 - Equal to Bran Sands measured daytime $L_{Aeq,\ T}$
- 675 - 45 - Equal to Coatham measured daytime $L_{Aeq,\ T}$

NOTE:
The noise levels predicted are based upon the methodologies outlined in:
- Chapter 11:Noise and Vibration
- Appendix 11A: Construction Noise Assessment Methodology

Details of assessment methodologies for assessing noise impacts on ecological receptors contained in Chapter 15: Ornithology and the Habitats Regulations Assessment

TITLE

FIGURE 11-4 A
NOISE DISTANCE BANDS
CO_2 EXPORT PIPELINE - CONSTRUCTION

REFERENCE

NZT_220817_ES_11-4A_v8

SHEET NUMBER: 1 of 1

DATE: 17/08/22

Project Management Initials: RL Designer: LC Checked: AR Approved: SE

Scale @ A3 1:40,000

0 2.5 5 km

AECOM

PROJECT
NET ZERO TEESSIDE PROJECT

Net Zero Teesside

APPLICANTS
NZT POWER LTD. AND NZNS STORAGE LTD.

KEY

- Site Boundary
- Power, Capture and Compressor Site
- CO_2 Export Pipeline - HDD Area
- Ramsar Site
- Special Protection Area

CO_2 Export Pipeline - HDD Area - Noise Distance Bands

Distance (m) - Level $L_{Aeq,\ T}$ (dB) - Significance

- 24 - 69 - IECS Receptor Value
- 90 - 58 - 10 dB above Bran Sands measured daytime $L_{Aeq,\ T}$
- 130 - 55 - 10 dB above Coatham measured daytime $L_{Aeq,\ T}$
- 290 - 48 - Equal to Bran Sands measured daytime $L_{Aeq,\ T}$
- 425 - 45 - Equal to Coatham measured daytime $L_{Aeq,\ T}$

NOTE:
Noise level predictions made with barrier that completely hides the HDD sources from the receiver.

The noise levels predicted are based upon the methodologies outlined in:
- Chapter 11:Noise and Vibration
- Appendix 11A: Construction Noise Assessment Methodology

Details of assessment methodologies for assessing noise impacts on ecological receptors contained in Chapter 15: Ornithology and the Habitats Regulations Assessment

TITLE
FIGURE 11-4 B
NOISE DISTANCE BANDS
CO_2 EXPORT PIPELINE - CONSTRUCTION
WITH FULLY SCREENING BARRIER

REFERENCE
NZT_220817_ES_11-4B_v5

SHEET NUMBER
1 of 1

DATE
17/08/22

APPENDIX F COASTAL PROCESS NOTE ON ROCK ARMOUR

Background

A marine outfall is required as part of the NZT Project for the discharge of cooling water from the plant. This note provides considers the potential for rock armour placed around the outfall diffuser head leading to scouring and significant changes in coastal morphology within Tees Bay. Currently two options for the outfall are under consideration:

(a) making use of the existing outfall structure constructed for the steel works previously located on the NZT site, or

(b) an alternative new outfall located to the east of the existing outfall.

The locations of the two outfalls are shown on Figure 2 which are approximately 750m offshore with bed levels at both locations of -6.0m ODN. For the new outfall it is anticipated that scour protection will be required to prevent erosion of seabed around the outfall diffuser structure. The project description identifies that (if required) a 100m^2 area of the seabed will be covered by the rock armour scour protection. The use of rock armour as a form of scour protection is proposed for the alternative new outfall only. It is not recommended to place rock armour around the existing outfall structure unless there is evidence of significant scour that might compromise its structural integrity.

Comments provided in this note on potential effects due to the presence of scour protection on the seabed are based on expert engineering judgement and knowledge of local site conditions, including information drawn from previous studies.

Sediment Transport within Tees Bay

Information from the analysis of sediment grab samples22 is provided in Figure 2 which shows the predominant sediment type to be Medium Sand within the area of Tees Bay where the outfalls are located extending offshore for a distance of more than 3km. This is also consistent with more recent information presented in a separate environmental statement23. A representative median grain size (D_{50}) for the sand of 0.2mm is therefore assumed.

Subsequent interpretation of sediment data combined with other datasets was used to establish a conceptual sediment transport model[22~~21~~] for Tees Bay, as shown in Figure 3. This illustrates the complex nature of sediment transport processes within the bay with the dominant (or net) nearshore littoral transport directed towards the east which reverses during easterly storm conditions. The additional process of cross-shore (onshore/offshore) sediment transport is also indicated within the bay, a typical mechanism that has a controlling influence on beach levels along the coast.

Metocean Conditions at the Outfall Location

[22] ABPmer (2004). Teesside Offshore Wind Farm – Coastal Processes Investigation.
[23] Forewind (2014) Dogger Bank Teesside A&B – Coastal Cable Corridor Assessment, Ch.6, Appendix D.

Tidal water level variations extracted from a calibrated numerical model2423 are shown in Figure 5 which shows a maximum tidal range within this period of approximately 5m and low water levels on spring tides reaching just below -2m ODN. A typical minimum water depth at the outfall location on a mean spring tide would therefore be around 4m (excluding surge effects).

Tidal currents extracted from the same model[24] at the location of the existing outfall are presented in Figure 6. This shows that peak tidal currents rarely exceed 0.3m/s, even during higher range spring tides. This low magnitude current would not on its own be sufficient to initiate scouring of the medium sand material found on the seabed therefore a combination of tidal and wave-induced currents will be required to initiate sediment motion, potentially leading to scour.

Tees Bay is relatively exposed with no headland features or offshore reefs or shoals that might otherwise reduce wave height reaching the coast. Figure 7 provides a wave rose plot showing that waves within the bay have a limited range of wave direction due to the wave crests aligning with the seabed contours. Outputs from a wave transformation model are provided in Figure 8 which shows limited attenuation of wave heights for a 1 in 10-year event up to a depth contour approximately 200-300m from the coastline.

Design Considerations

Rock armour placed on the seabed around the outfall structure will be exposed to both waves and currents which will be important design input conditions. The grading of the rock armour used should be designed to be statically stable (i.e. no damage or movement of the rock allowed for) under the required range of design conditions, including consideration of future climate change effects and taking account of the design life of the outfall structure.

The footprint of the scour protection is likely to be a 10-12m diameter circle. The circular footprint allows the structure design to accommodate variations in current direction and near-bed wave orbital velocities which will also vary depending on the incident wave direction. The outer edge of the scour protection will incorporate a slope that transitions from the upper level of the rock armour to the surrounding seabed levels.

The grading of the scour protection is likely to be similar to that used for marine cable protection in situations where cables cannot be buried (i.e. at crossing points with other cables or pipelines). To minimise the effect of the protection works on hydrodynamic conditions and consequently seabed morphology, best practice in design involves aligning the structure so that side slopes are perpendicular to the dominant flow directions. The circular footprint for the proposed scour protection therefore follows this design philosophy minimising any near-field and far-field effects.

[24] AECOM (2021). Net Zero Teesside – Environmental Statement, Volume III, Appendix 14E, Coastal Modelling Report.

Preliminary sizing of rock armour for scour protection around the base of the Teesside Offshore Wind Farm22~~21~~ turbine support structures established that a nominal diameter (D_{n50}) of 0.07m would be required to prevent erosion due to the 1 in 50-year return period wave event. Although the wind farm structures are in deeper water where wave heights will be larger than at the outfall location, as shown in the output from a wave transformation model (Figure 8), a similar grading of material is assumed to be suitable for scour protection at the outfall location.

The relatively small size of the rock required means that the transition in the seabed profile between the natural material and the rock armour will not be as significant as it would be if the rock was much larger, say a nominal diameter of 0.5m. As a result, the degree of turbulence and depth of scour around the outer edge of the scour protection will also be much smaller and similar in scale to the size of the rock. To further mitigate the depth of scour around the perimeter of the protected area, shallow sides slopes (i.e. 1:2 or less) will be incorporated into the design and the height of the protection above the seabed should be limited to less than 1m which represents approximately 25% of the water depth at low water on a mean spring tide.

Due to the relatively shallow water depth at the outfall location, if the upper level is required to be higher than 1m above the seabed, it is recommended that the design should be supported by more detailed analysis (i.e. application of a phase-resolving numerical wave model) to assess the degree of deformation of wave crests as they pass over the locally raised seabed. If the wave crests passing over the submerged scour protection are only slightly modified and are subsequently shown to regain a uniform alignment before reaching the coast, then it can be concluded that there would be negligible risk of any change to the natural coastal morphology. If, however, this were found not to be the case, then it is possible that a feature such as a salient or tombolo could form and further, more detailed analysis would be required.

Given the likely size of rock armour required, the horizontal/vertical dimensions of the scour protection and the use of shallow side slopes to transition from the seabed to the surface profile of the rock armour, the scale of any sediment disturbance around its perimeter will be small. The sediment that is disturbed will be non-cohesive sand with a relatively high settling velocity that will be deposited back onto the seabed within a localised area. Based on a median grain size of 0.2mm for sand particles, the corresponding fall velocity is calculated to be 0.02m/s based on established formulae25, as presented in Figure 9. For a sand particle falling a vertical distance of 1m with a constant ambient current of 0.3m/s, the corresponding horizontal travel distance would be 15m. This can be used to provide an indicative Zone Of Influence (ZOI) for sediment disturbed as a result of scouring around the perimeter of the rock armour protection. A worst-case footprint can therefore be represented by a 50m diameter (i.e. 25m radius) circle centred on the location of the outfall diffuser.

[25] Soulsby (1997). Dynamics of Marine Sands.

Summary Comments

The following summary comments are provided based on an interpretation of the available information described in this note:

- Due to the bi-directional nature of tidal currents at the outfall location and exposure to waves from a range of directions, a circular footprint for the scour protection should be provided.
- The required rock armour should be designed to be statically stable and is likely to have a nominal diameter (D_{n50}) of the order 0.1m.
- The vertical projection of the rock armour above the seabed should be limited to 1m to avoid interfering with wave propagation that could in turn affect sediment transport processes.
- If the rock armour is required to extend more than 1m above the seabed, further detailed modelling of wave processes will be required to establish whether or not sediment transport processes are likely to be affected.
- Shallow side slopes (1:2 or less) should be provided around the outer edge of the protected area to minimise turbulent flows at this location and thus ensure that any localised scour is minimised.
- There is likely to be minor, localised disturbance of the seabed around the perimeter of the area where rock armouring is used with the medium sized sand carried a distance of up to 15m by the ambient currents. The ZOI can therefore be defined by a 50m diameter circular area.

In conclusion, if the recommendations for design of the outfall scour protection as summarised below are followed:

- max. diameter limited to approx. 10-12m;
- height above seabed level less than 1m;
- armour size approx. 0.1m; and
- shallow side slopes of 1:2 are to be incorporated into the design.

Any effects resulting from the scour protection will then be limited to local, small-scale variations in seabed levels within a 25m radius of the outfall structure and there will be no associated wider scale impacts on coastal processes or morphology.

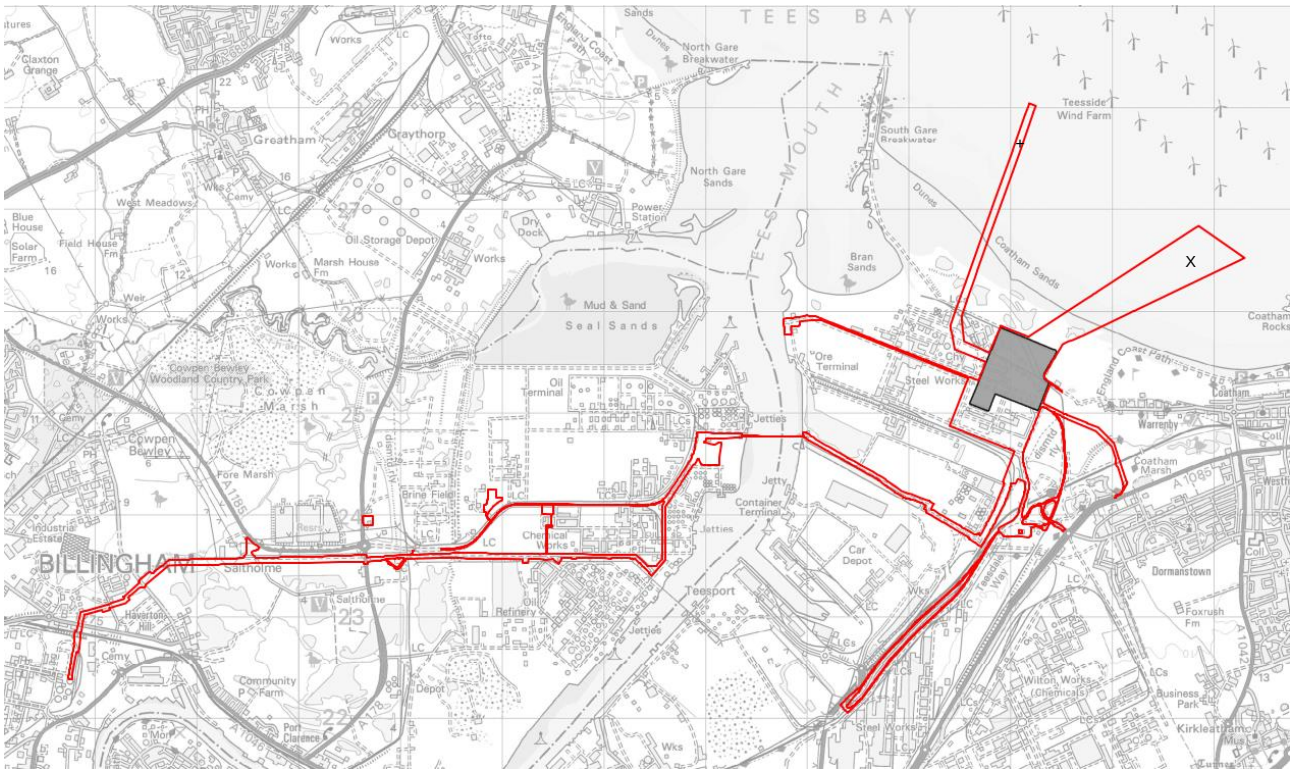


Figure 2. Net Zero Teesside Site Boundary and Potential Effluent Discharge Locations (+ Original Outfall, x Replacement Outfall)

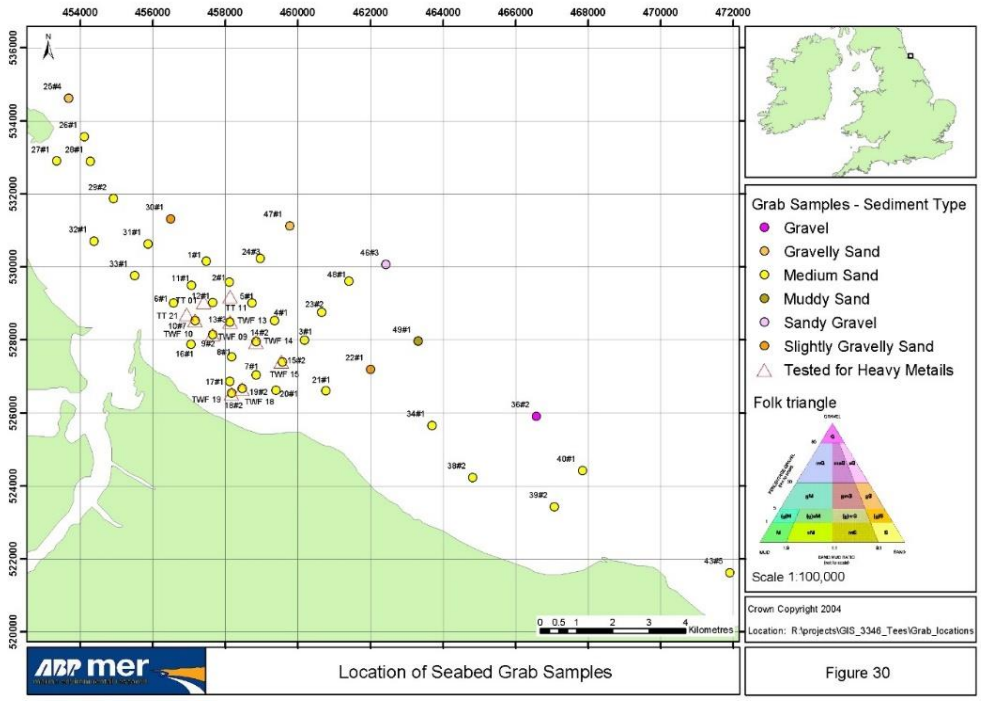
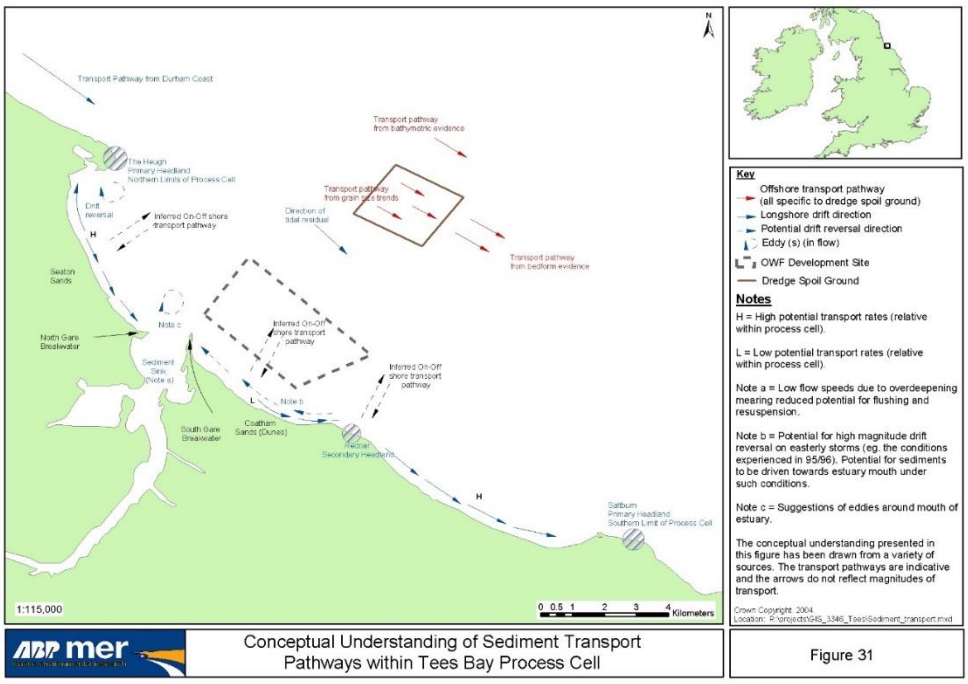


Figure 5. Location of seabed sediment grab samples (source: ABPmer (2004))

Figure 6. Tees Bay Conceptual Sediment Transport Model (source: ABPmer (2004))



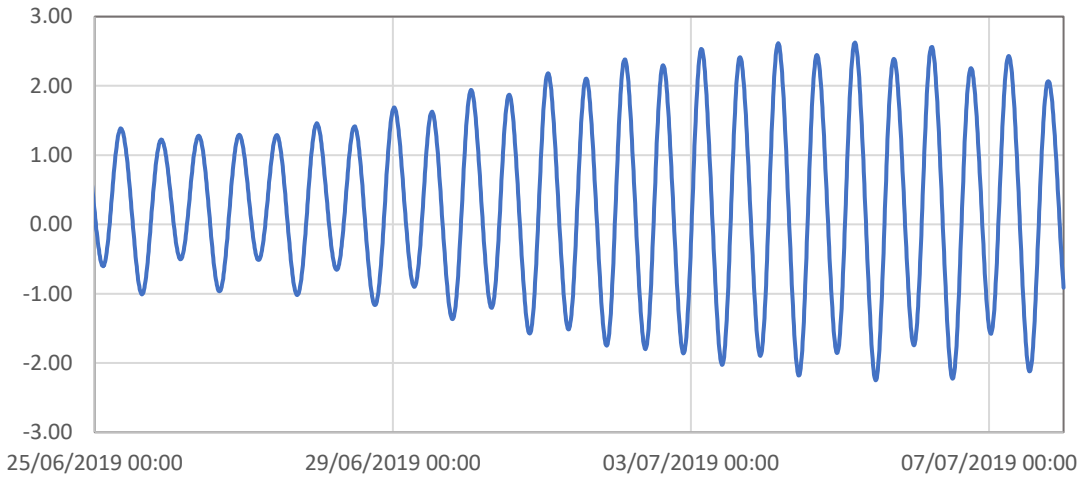


Figure 5. Tidal water levels (m ODN) at the existing outfall location

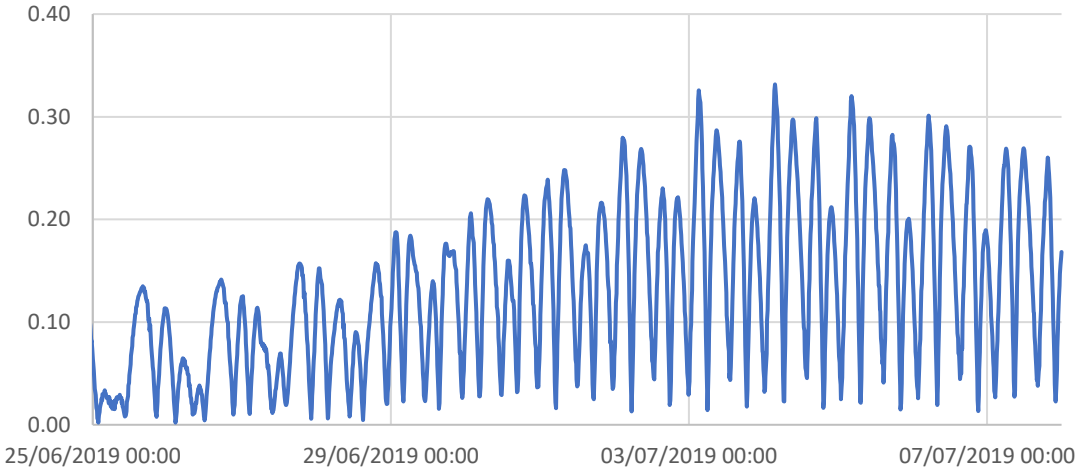


Figure 6. Current speeds (m/s) at the existing outfall location

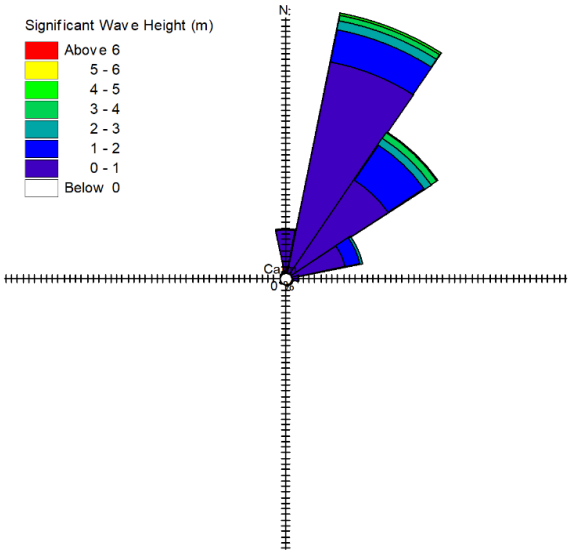


Figure 7. Nearshore wave rose (direction from °N) for Tees Bay - Oct to Dec 2003 (source: ABPmer (2004))

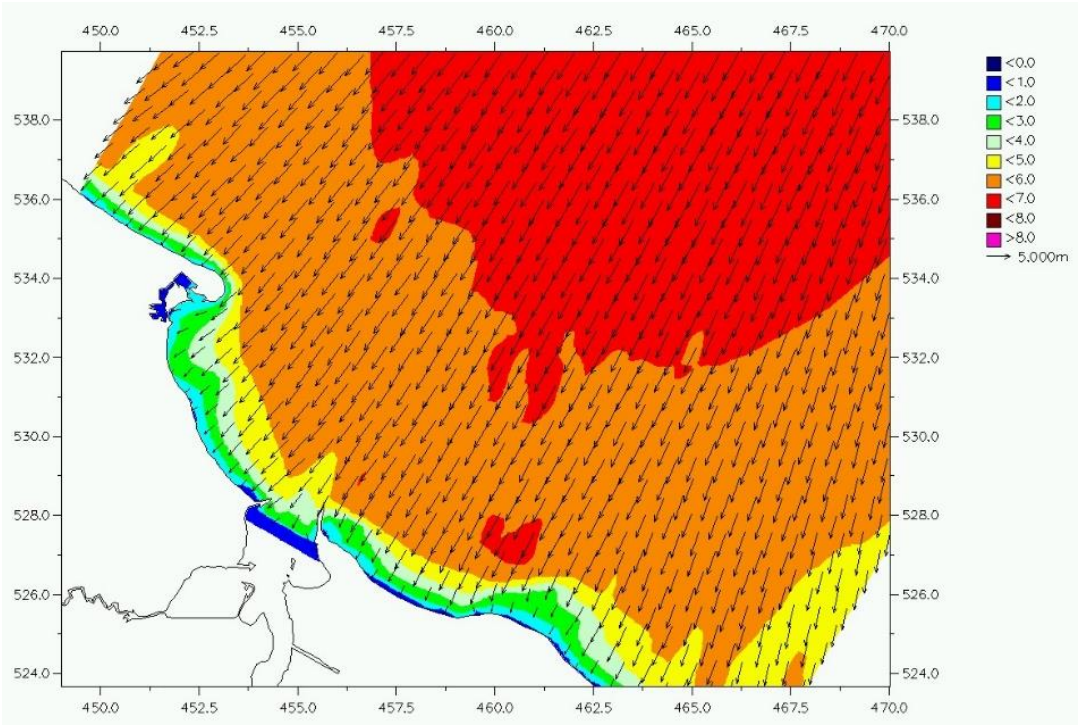


Figure 8. Wave height contours and direction vectors for 1 in 10-year waves (source: ABPmer (2004))

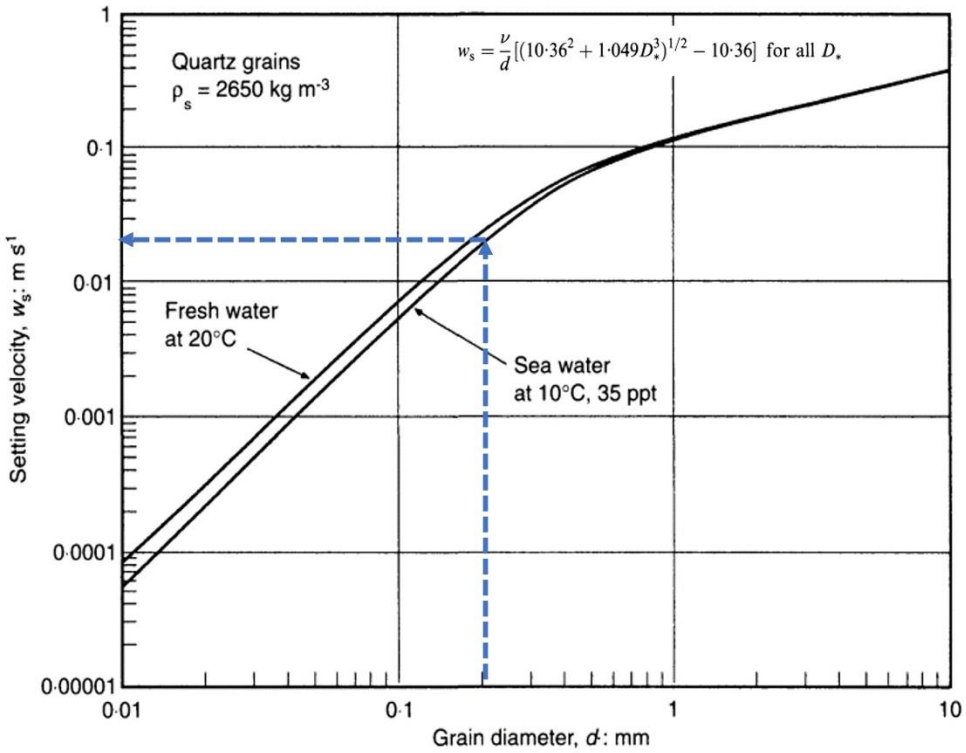


Figure 9. Estimation of settling velocity for medium sand (source: Soulsby (1997))