8 MARINE ECOLOGY

8.1 Introduction

8.1.1 This section of the ES describes the existing environment in relation to marine ecology and assesses the potential impacts of the construction and operational phases of the proposed scheme. The decommissioning phase would not give rise to any impacts on the marine environment and, therefore, is excluded from further consideration within this section. Mitigation measures are detailed where required and potential residual impacts are assessed.

8.1.2 The potential impacts of the proposed scheme on waterbirds and fish populations are assessed in **Section 9** and **Section 11** respectively.

8.1.3 This section of the ES satisfies the Regulation 5(2)(l) of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009.

8.2 Guidance and consultation

Policy and guidance

National Policy Statement for Ports

8.2.1 The assessment of potential impacts on marine ecology has been made with reference to the NPS for Ports. The particular assessment requirements relevant to marine ecology, as presented within the NPS for Ports, are summarised in **Table 8-1**.

Table 8-1 Summary of NPS for Ports requirements with specific regard to marine ecology

NPS requirements	NPS reference
Where the development is subject to EIA, the application should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological interests.	Section 5.1.4
The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.	Section 5.1.5
The ES should include an assessment of the effects on the coast. In particular, the applicant should assess the effects of the proposed project on marine ecology, biodiversity and protected sites.	Section 5.3.5
The applicant should be particularly careful to identify any effects on the integrity and special features of Marine Conservation Zones, Special Areas of Conservation (SAC) and candidate SACs, Special Protection Areas (SPA) and potential SPAs, Ramsar sites, actual and potential Sites of Community Importance and Sites of Special Scientific Interest (SSSI).	Section 5.3.7

National Planning Policy Framework

8.2.2 The NPPF sets out the Government's planning policies for England and how these are expected to be applied. The planning system should contribute to and enhance the natural and local environment by:

- recognising the wider benefits of ecosystem services; and,
- minimising impacts on biodiversity and planning net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future processes.

8.2.3 The NPPF also states that when determining planning applications, planning authorities should aim to conserve and enhance biodiversity by applying the following principles:

- if significant harm resulting from a development cannot be avoided, adequately mitigated or, as a last resort, compensated for, planning permission should be refused;
- proposed development on land within or outside a SSSI likely to have an adverse effect on SSSI should not normally be permitted; and,
- opportunities to incorporate biodiversity in and around developments should be encouraged.

Redcar and Cleveland Borough Council Local Plan

8.2.4 Development Plan Document policies of relevance when considering the proposed scheme in relation to marine ecology include:

- Policy CS24 (Biodiversity and geological conservation) of the RCBC Core Strategy Development Plan Document (July 2007): the Borough's biodiversity and geological resource will be protected and enhanced. Priority will be given to:

  - protection of the integrity of the European sites in and near the Borough;
  - conserving and enhancing biodiversity and geodiversity sites and features in line with PPS9[3];
  - improving the integrity and biodiversity value of wildlife corridors particularly along the coast, around the Teesmouth estuary and linking with the North York Moors;
  - meeting the objectives and targets in the UK and Tees Valley Biodiversity Action Plan (recently disbanded and replaced by the Tees Valley Nature Partnership);
  - encouraging management of landscape belts for nature conservation;
  - protecting ancient woodland and veteran trees;
  - strengthening populations of protected species; and,
  - improving site management and increasing public access to wildlife sites.

[3] Section 11 of the NPPF effectively replaces PPS9

Stockton Borough Council Core Strategy Development Plan Document

8.2.5 Policy CS4 of the SBC Core Strategy Development Plan Document safeguarded land on the north bank of the river. No port or river based development will be permitted on, or on land immediately adjacent to the North Tees mudflat component of the Tees and Hartlepool Foreshore and Wetlands SSSI.

Tees Valley Nature Partnership

8.2.6 The Tees Valley Nature Partnership (TVNP) is a cross sector Tees Valley wide partnership that has been formed to take a strategic overview of the natural environment, and to investigate ways to manage, enhance and promote the natural environment so that the needs of nature, people and the economy are met. The TVNP was formed as a response to the Natural Environment White Paper (NEWP) (2011), in which the government invited new and existing partnerships to come together to form Local Nature Partnerships (LNP). The TVNP received Government recognition as the LNP for the Tees Valley in July 2012. The TVNP has a number of key priorities outlined within the 'Priorities for Partnership' section of the TVNP, namely:

- raise the profile of the Tees Valley as an attractive place to live, work or visit;
- continue to work to protect and enhance the geodiversity and biodiversity of the Tees Valley ensuring the conservation, restoration and creation of key landscapes and habitats; and,
- seek positive outcomes for both nature and the local economy by working closely with the economic sector.

Guidance documents

8.2.7 The principal guidance documents which have been used to inform the baseline characterisation and the assessment of impacts with respect to marine ecology are as follows:

- Marine Monitoring Handbook (JNCC, 2001).
- Guidelines for ecological impact assessment in Britain and Ireland (Institute of Ecology and Environmental Management (IEEM) 2010) (these guidelines are specifically relevant to marine and coastal ecological impact assessment).

Consultation

Formal consultation

8.2.8 **Table 8-2** provides a summary of the comments received from PINS through its Scoping Opinion (January 2014) (**Appendix 4.2**) and during consultation under Section 42 of the Planning Act 2008 (September 2014) with specific regard to marine ecology.

Consultation undertaken with regard to the benthic ecological survey

8.2.9 Royal HaskoningDHV produced a specification for a benthic ecological survey for the proposed scheme during November 2013, and a revision in March 2014 to take account of comment received and changes to the proposed scheme design (**Appendix 7.1**). The specification was issued to Natural England, the MMO and the Environment Agency requesting comments on the proposed approach prior to the survey being undertaken. **Table 8-3** provides a summary of the responses received from the above stakeholders with regard to the scope of the benthic ecological survey. These comments were taken into account in the March 2014 revision.

8.2.10 Consultation undertaken with the Environment Agency during April 2014 identified that it has undertaken benthic ecological monitoring throughout the Tees estuary (downstream of the Tees Barrage) for a number of years. This data was provided by the Environment Agency during April 2014 and is summarised within **Section 8.4**.

8.3 Methodology

Study area

8.3.1 The study area for this section of the ES covers the area which would be directly affected by the proposed marine works (dredging and port terminal construction), and the adjacent areas which have the potential to be indirectly affected (e.g. through sediment deposition). The study area, therefore, comprises the tidal Tees estuary between Teesmouth and the Tees Barrage.

Existing environment

Existing benthic ecological data from the Tees estuary

8.3.2 The results of a benthic survey undertaken in December 2008 as part of the EIA for the consented QEII jetty refurbishment scheme, located approximately 1.5km upstream of the proposed port terminal at Bran Sands, and the 2006 NGCT studies are contextually relevant to the current proposals, although it recognised that the information is several years old. **Figure 8-1** illustrates the location of samples recovered during benthic surveys to inform the EIAs for both NGCT and the QEII jetty refurbishment.

8.3.3 A review of the Environment Agency's benthic ecological monitoring data recovered throughout the Tees estuary for a number of years has also been undertaken as part of this assessment. The locations of the Environment Agency sampling are shown in **Figure 8-2**.

Table 8-2 Summary of comments in the PINS Scoping Opinion and received during consultation under Section 42 of the Planning Act 2008 with regard to marine ecology

Comment	Response / section of the ES in which the comment is addressed
Scoping Opinion (January 2014)	
Secretary of State	
The Secretary of State was pleased to note that a targeted benthic survey was proposed, comprising grab samples and beam trawl surveys and that the scope of the survey is to be agreed with Natural England, Cefas, the MMO and the Environment Agency.	**Table 8-3**
There a number of ecologically designated sites within the vicinity of the proposed scheme. In addition, Seal Sands is an important seal habitat and potential impacts on this site should be assessed.	**Sections 8.4**, **Section 8.5**
The EIA should consider effects on marine ecology relating to, inter alia, increased disturbance and displacement, habitat loss and construction and operational activities including piling, lighting and dredging.	**Sections 8.5** and **8.6**
The Secretary of State welcomes that the assessment will draw on the results of the sedimentary and hydrodynamic assessment.	Noted. See **Section 8.**.
Detailed information should be included in the ES regarding the dredging and piling works in order to contribute to the marine ecology assessment.	Refer to **Section 3** (Project Description)
Environment Agency	
Development should not encroach either physically, or via its associated infrastructure into the intertidal environment. The Environment Agency is committed to no net loss of intertidal and subtidal habitat. The Environment Agency would welcome further discussion regarding this option (combi-piled wall retaining fill material). When encroachment is shown in plans, considerable justification together with details for mitigation and compensation would need to be included to secure support.	**Section 8.5**

Comment	Response / section of the ES in which the comment is addressed
The development is in close proximity to nationally and internationally designated sites for nature conservation. On this basis, proposed piling works may disturb marine mammals within the area. The Environment Agency would welcome further discussions with the developer, Natural England and the MMO regarding appropriate timings to safeguard all interests.	Timing constraints were discussed at a consultation meeting with the Environment Agency, Natural England and the MMO in October 2014. The outcome of these discussions has been used to inform the EIA.
The issue of coastal squeeze needs to be incorporated into the design to mitigate for sea level rise and habitat creation.	Noted
The Environment Agency advised that the Bran Sands lagoon should be assessed for ecological value including benthic invertebrates and fish. The effect of any works on benthic invertebrates, fish, eels and water quality should be assessed.	See note below*
MMO	
The MMO concurs with the description of likely impacts to marine ecology, as set out within the Scoping Report.	Noted
The applicant proposed to undertake a benthic survey to characterise the marine communities within the Scoping Report. The MMO considers this is necessary to properly undertake the impact assessment and so welcomes this commitment.	**Table 8-3**
The effects on marine ecological receptors from changes to marine sediment and water quality must also be assessed.	**Section 8.5**
Natural England	
Natural England would expect the ES to quantify habitat loss not only in the lagoon but also at the intertidal frontage which would be lost to the new quay.	**Section 8.5**
Given the proximity of the identified development site to designated sites, the piling element of both the construction operations under consideration should be assessed. A realistic worst case scenario and subsea acoustic modelling undertaken.	**Section 8.3**
The EIA will need to consider impacts upon local wildlife and geological sites. Contact the Tees Valley Wildlife Trust, local geoconservation group Tees Valley RIGS group or local sites body in this area for further information.	**Section 8.4**

Comment	Response / section of the ES in which the comment is addressed
The ES should thoroughly assess the impact of the proposals on habitats and/or species listed as Habitats and Species of Principal Importance within the England biodiversity list. Consideration should also be given to LBAP species and habitats.	**Section 8.5**
Section 42 comments	
Environment Agency	
Both options show significant loss of available intertidal habitat. Intertidal habitats are a key marine habitat and have high abundance of species. They are highly productive which support large areas of predatory birds and fish. They provide feeding and resting areas for populations of migrant and wintering waterfowl and are also important nursery areas for fish. On the Tees, areas of mudflat are fragmented and this area is seen as a potentially important resource.	**Section 8.4**
The Environment Agency requested additional information regarding how often the mudflats are exposed at Bran Sands. This would enable a full understanding of impacts on the intertidal area. More consideration may need to be given to how a design could be developed to retain more of this habitat, even if it doesn't function in its current form.	**Section 8.5**
There is little assessment of any suitable alternatives or mitigation. The PER does not acknowledge the need to compensate for loss of mudflat. Further assessment required together with justification for the preferred option. Details of mitigation and compensation need to be included. The loss of subtidal habitat also needs to be considered in the context of mitigation or compensation requirements.	**Section 8.5**
The application may provide opportunities to incorporate features into the design which are beneficial to wildlife, such as greater provision of intertidal habitat and habitat creation, beyond those required for mitigation as described in Section 2.2 [of the response].	**Section 8.5**
MMO	
The MMO disagrees with the statement in Paragraph 8.5.14 of the PER ("….*given the unconstrained nature of the tides within the Tees, it is anticipated that dilution would rapidly reduce the concentration of contaminants to acceptable levels*"). This statement has been provided prior to the availability of sediment analysis results. The MMO notes that a full assessment will be undertaken in the EIA however.	Noted. **Section 8.5**

Comment	Response / section of the ES in which the comment is addressed
The applicant has stated if no alternative uses for dredged material can be found, then all dredged material will be disposed of offshore. The applicant should ensure that if this is the case (or unknown at the time of submission) the EIA should assess the impacts of all material being disposed offshore.	See **Section 3** for a description of material which is proposed to be disposed offshore. An assessment of the potential impact of disposal is contained in **Section 23**.
Natural England	
The impact on intertidal habitat needs to be considered in the context of bird declines on Teesside and also the massive historic loss of intertidal within the estuary. Species that feed on intertidal mud tend to have experienced the greatest decline. This suggests the intertidal is already stressed and so less able to withstand further impacts.	**Section 8.5**
Further investigation on the nature of water exchange between the estuary and Bran Sands lagoon is awaited with interest as this may provide significant opportunities to mitigate impacts. Natural England considers that enhanced water control is key to the future of the lagoon, with the aim of increasing tidal exchange, thereby creating new intertidal margins within the lagoon to mitigate for loss in the estuary. This would need a hydrological study to produce optimal designs for the necessary infrastructure. Improved control over connectivity would and flow would permit the isolation of the lagoon from the estuary in the event of a spill. Small islands within the lagoon could be reinstated as part of this project to provide roosting and nesting opportunities.	The proposed scheme involves the inclusion of a control structure to enable the lagoon to be isolated from the estuary. However, no active control of water levels in the lagoon is proposed (see **Section 3**). Habitat enhancement proposals include the creation of islands for roosting and nesting that would extend the intertidal margin.
The king piles for the solid quay option will be approximately 2m in diameter whereas the subsea acoustic modelling assumes a pile diameter of 914mm. Clarity is requested as to why the worst case pile diameter was not used for modelling.	**Section 8.3**
The ES should thoroughly assess the impact of the proposals on habitats and/or species listed as Habitats and Species of Principal Importance. Section 40 of the NERC Act 2006 places a general duty on all public authorities to conserve and enhance biodiversity. Natural England advises that survey, impact assessment and mitigation proposals for Habitats and Species of Principal Importance should be included in the ES. Consideration should also be given to those species and habitats included in the relevant LBAP.	**Section 8-5** and **8-6**

Comment	Response / section of the ES in which the comment is addressed
Natural England would expect that the timings for repositioning and boring / pre-augering to be fully documented in a piling method statement. Therefore an assessment could be made on the duration of the non-piling period. Natural England recommends a minimum of 8 hours continuous break in every 24 hours where no impact piling is carried out.	**Section 8.5**
The application may provide opportunities to incorporate features into the design which are beneficial to wildlife, such as provision of bat boxes, provision of intertidal habitat and habitat creation and enhancement measures beyond those required for mitigation. Measures to enhance the biodiversity of the site should be secured in accordance with Paragraph 118 of the NPPF. Additional, attention is drawn to Section 40 of the NERC Act 2006.	**Section 8.5**
The EIA will need to consider whether there would be a likely significant effect on the Teesmouth and Cleveland Coast SPA. Also the potential effect on seals during construction should be considered. Otherwise, there are unlikely to be any adverse effects on ecological receptors in Hartlepool.	The implications of the proposed scheme under the Habitats Regulations have been considered within the HRA (**Document 8.3**). Potential impacts on seals are considered within **Sections 8.5** and **8.6**.

* The Scoping Opinion from PINS was based on a proposed scheme which required partial reclamation of the lagoon to provide a platform for the construction of a storage shed landward of the port terminal. Partial reclamation of the lagoon is no longer proposed. As such, an assessment of the existing ecological condition of Bran Sands lagoon has not undertaken as part of the EIA process. However, the usage of the lagoon by waterbirds is described in **Section 9.4**.

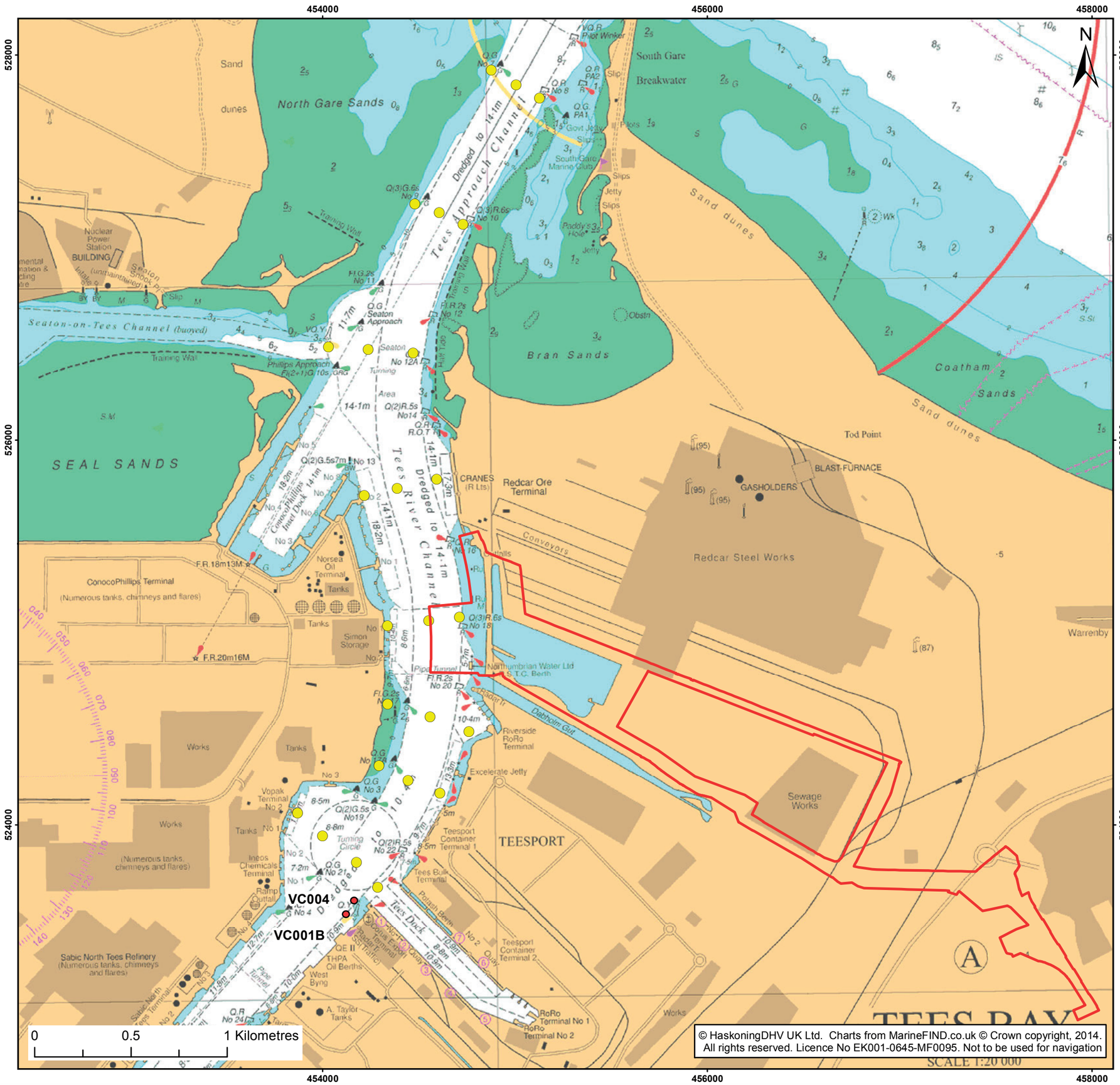
Table 8-3 Summary of consultation responses on the scope of the benthic ecological survey

Initial comment	Royal HaskoningDHV response to comment	Follow up response from stakeholder	Outcome
Environment Agency			
The proposed sampling strategy is acceptable.	None required.	None.	Environment Agency content with approach for benthic ecological survey.
Sampling should follow the guidance outlined within the 'Practitioners Guide to the Infaunal Quality Index, Water Framework Directive: Transitional and Coastal Waters, Version 09 (Environment Agency, 2012).	Sampling would be undertaken in accordance with the Environment Agency's guidance.	None.	
Natural England			
Further clarity was required on the extent of intertidal habitat to be lost. For the suspended deck option, a stable slope would need to be created through the foreshore area.	The extent of intertidal area affected would be minimised. This will be quantified as the design work progresses and reported in the ES. We propose to take samples as far up the foreshore as the vessel draft allows.	As the creation of a stable slope would create a larger footprint, a map showing the total area of the proposed dredge in the context of the lower estuary would be of help.	A figure showing the total area affected by the capital dredging and quay construction to be included in the ES.
Confirmation was required on the dredge volumes. The new worst case dredge is 1.2Mm^3 which is an increase of 150,000m^3 on the previous design.	The initial estimate of total dredge (1.05Mm^3) as stated in the original version of the specification was made early in the design process. During the concept design, the total dredged volume was updated to 2.05Mm^3. The revised estimated maximum dredged volume is 1.65Mm^3 (worse case, based on the open quay structure).*	This is large dredge in the context of the Tees estuary. It is worth noting that this is the same if not more than the annual maintenance dredge for the whole tidal river system.	Point noted.

Initial comment	Royal HaskoningDHV response to comment	Follow up response from stakeholder	Outcome
Confirmation is required as to whether Seal Sands is included in the sampling specification.	We do not propose to sample Seal Sands as no capital dredging would occur in the lower Tees estuary. It is considered unlikely that sediment that is suspended by the current proposed capital dredging would affect Seal Sands.	Seal Sands is a sensitive receptor and Natural England would need more information on what this assertion is based on.	Additional justification was provided to Natural England in the form of sediment dispersion plots from the NGCT EIA, which predicted negligible sediment deposition at Seal Sands. Natural England confirmed this justification was satisfactory.
Natural England noted that maintenance dredge volumes would be predicted during the EIA process. However, consideration should also be given to the interruption of sediment transport in the lower estuary resulting from this process.	Point noted. The sediment transport studies to be undertaken as part of the EIA process would inform this.	None	No additional discussion on this point required.
MMO			
The systematic sampling design proposed is suitable for the project.	None required.	None required.	The MMO was content with the approach to the survey. No further action required in response to the remaining points.
It is unclear where some of the areas which are referred to in the report are located (e.g. North and South Gare, Bran Sands, Seal Sands). For clarification, a map of these locations should be provided. Assuming that these samples are to be taken to provide data regarding the types of assemblages that are likely to be impacted, i.e., they do not form the	Points noted. Further clarification was requested regarding the comment on Figure 8 which shows sampling in Bran Sands lagoon.	There seems to have been misunderstanding between the advice provided and that sent to the applicant. Provided that Figure 8 provides details of the sample locations, there is no further need to clarify this point and that the stations are suitable	

Initial comment	Royal HaskoningDHV response to comment	Follow up response from stakeholder	Outcome
basis of a monitoring plan, and no sample is to be regarded as 'impact' and 'control'. The concentration of stations in the region of the proposed new terminal is also suitable. The collection of data regarding the biological assemblages at Seal Sands and Bran Sands (both are predicted to experience direct and/or indirect loss/change) is suitable, but as these areas are not known I am unable to provide specific advice as to whether they are sufficiently sampled. Figure 8 did not see specifically pertaining to Bran Sands.		located.	
It is unclear what is being proposed for the trawl surveys. The applicant should confirm the mesh size and whether specimens will be counted or weighed.	We propose undertaking trawls at 20 locations across the whole survey zone. They are in addition to the grab samples and do not replace taking grabs at any location. We proposed using 20mm mesh size with 5mm cod end. It is proposed that specimens would be counted.	The sampling strategy and the trawl details are acceptable for the purpose. A detailed methodology should be included in the final ES.	
Following sub-sampling, the sample can be placed onto a sieve, and photographic and other information / notes taken. With regards to the PSA sub-sampling of the intertidal cores, I would recommend using a syringe for the PSA and taking the sample adjacent to the macrofaunal core.	Point noted. This was built into the survey design.	Point noted.	

* This figure was revised down to a maximum of 1,122,000m^3 as the concept design was progressed (see **Section 3**)



Legend:

- DCO Order Limits
- NGCT Benthic Sample Sites
- QEII Benthic Sample Sites

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title: Environmental Statement: Benthic Sample Locations for the NGCT and QEII Berth Near Harbour Facilities

Part:	Figure:	Drawing No:
HF	8.1	9Y0989-HF-8-001

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
1	04/03/2015	JE	SR	A3	1:20,000
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Co-ordinate system: British National Grid

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Legend:

- DCO Order Limits
- Benthic Sampling Locations

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title:

Environmental Statement: Environment Agency's Benthic Sampling Locations Near Harbour Facilities

Part:	Figure:	Drawing No:
HF	8.2	9Y0989-HF-8-002

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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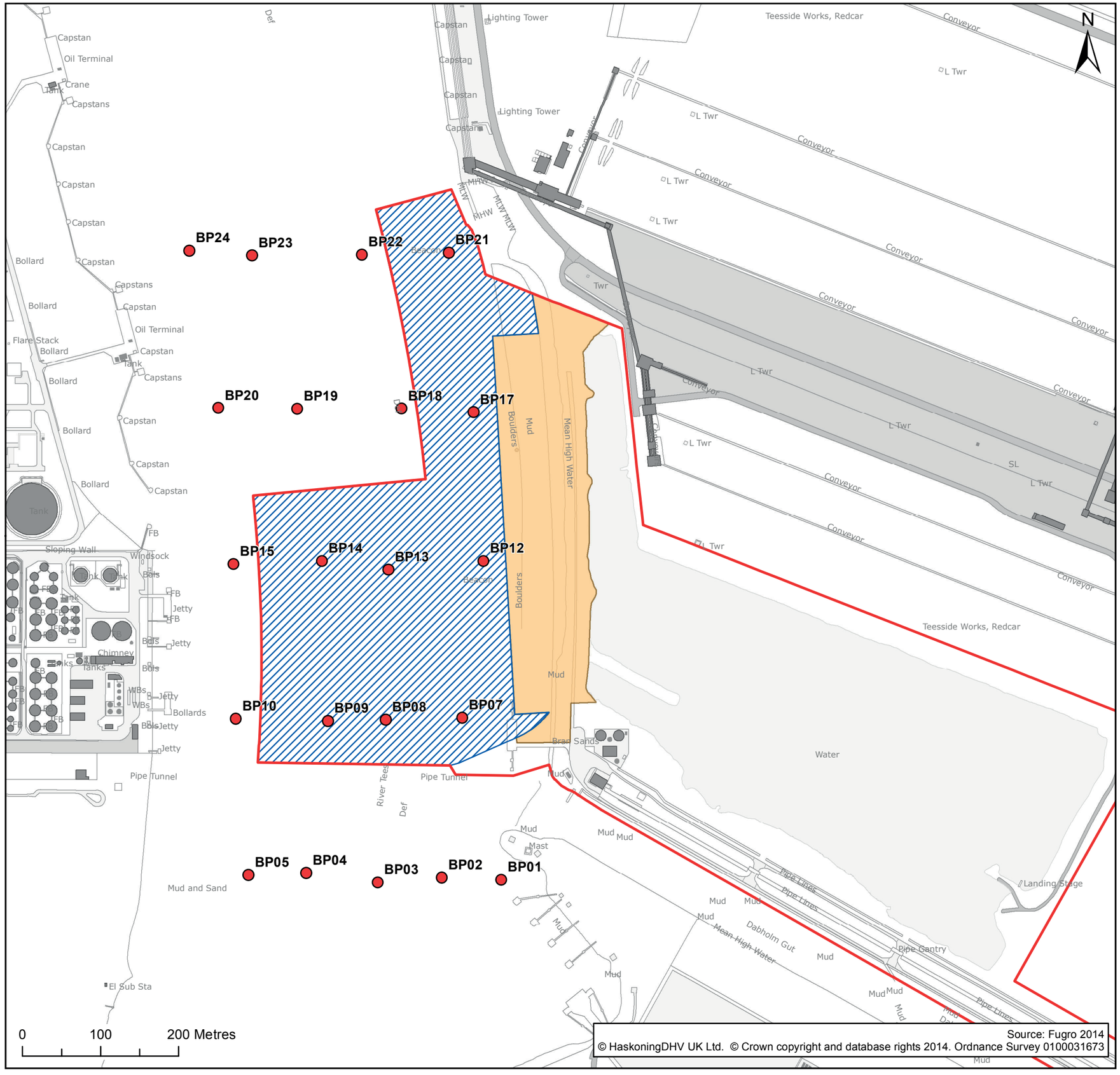

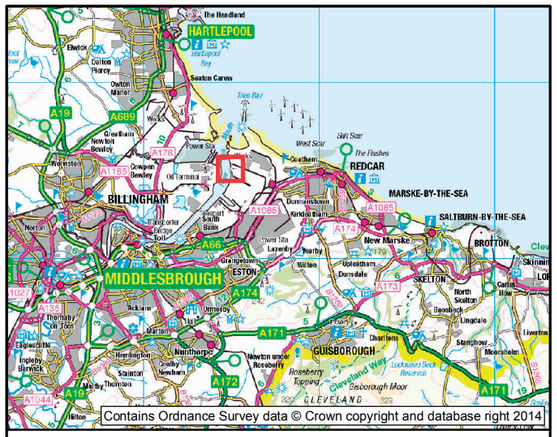

Legend:

- DCO Order Limits
- Dredge Area Envelope
- Quay Area Envelope
- Benthic Sample Location*

*Proposed sample locations BP06, BP11 and BP16 were abandoned
DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title:

Environmental Statement: Benthic Ecology Sampling Locations

Part:	Figure:	Drawing No:
HF	8.3	9Y0989-HF-8-003

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid

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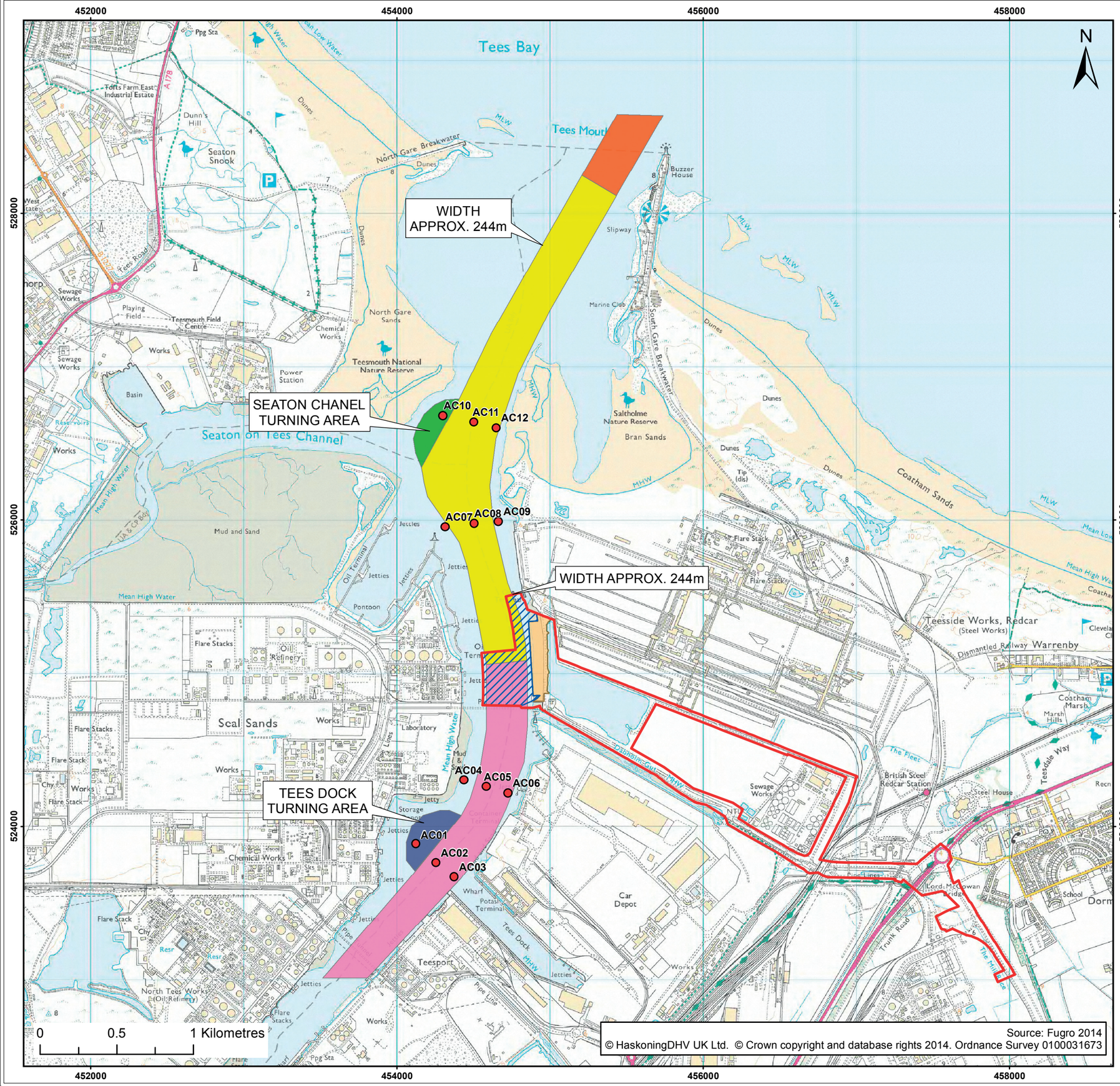

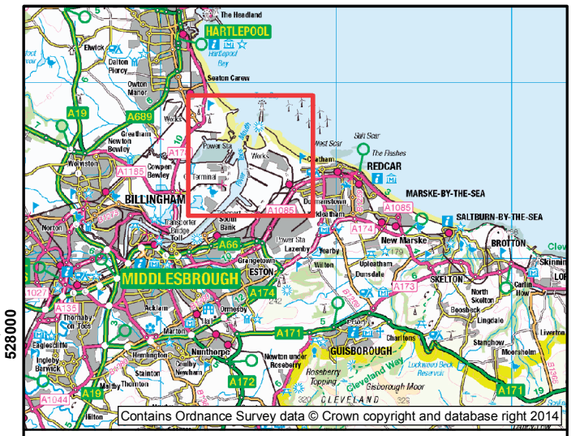

Legend:

- DCO Order Limits
- Dredge Area Envelope
- Quay Area Envelope
- Benthic Sample Location

Current Dredged Depths

- 15.4m
- 14.1m
- 10.4m
- 8.8m
- 11.7m

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title: Environmental Statement: Benthic Sampling Locations within the Navigation Channel

Part:	Figure:	Drawing No:
HF	8.4	9Y0989-HF-8-004

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
1	04/03/2015	LB	SR	A3	1:25,000
0	09/12/2014	LB	SR	A3	1:25,000

Co-ordinate system: British National Grid

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Site-specific benthic ecological survey and particle size analysis

8.3.4 In order to describe the existing environment in 2014 within and adjacent to the footprint of the proposed scheme, a survey consisting of a total of 36 subtidal 0.1m^2 Day grab samples (24 within and adjacent to the berthing pocket and 12 along and adjacent to the approach channel, upstream and downstream of the site of the proposed terminal) was undertaken; as shown on **Figure 8-3** and **Figure 8-4**. The sampling locations cover the area that would be directly affected by the marine works and the adjacent areas that potentially would be indirectly affected (e.g. through sediment deposition during capital dredging).

8.3.5 The benthic ecological survey was undertaken during July 2014 by FugroEmu. In addition to the sampling locations agreed with Natural England, the Environment Agency and MMO in advance of the survey, an attempt was made to take additional samples higher up the shallower intertidal area. However, water depth towards the shoreline beyond the most inland of the sampling stations agreed prior to the survey was too shallow, or the bed was too rocky, to obtain a sample. One of the proposed grab samples within the approach channel (AC03) could not be recovered (after five attempts) due to hard ground conditions. A total of 32 Day grab samples were, therefore, recovered during the survey.

8.3.6 Upon retrieval, the samples were released onto a 0.5mm mesh stainless steel sieve and examined for suitability and photographed to determine sample volume, visual characteristics of the sediment and presence of anoxia and epifauna. A sub-sample of the sediment was retained for particle size analysis (PSA) to enable any sediment community associations to be determined. The sub-sample for PSA analysis was recovered using a small core (a cut-off 100ml syringe) to remove sediment from the undisturbed surface of the sample. This PSA sub-sampling technique standardised the amount of sediment recovered from each core, standardised the sampled sediment depth profile between sampling stations, minimised bias of sampling of certain sediment types and reduced the volume of sediment required for PSA analysis.

8.3.7 The remainder of the sample was back-washed through the sieve and collected in a storage vessel, where it was preserved in formalin prior to further sieving and laboratory analysis. The analysis was undertaken by FugroEmu.

8.3.8 In addition to the infaunal sampling described above, a benthic trawl was deployed at 10 of the 32 sampling locations (in addition to the Day grab samples) using a 20mm mesh with a 5mm cod end, with the trawls evenly distributed across the sampling area. Fish, shrimp and other commercial invertebrates were counted and measured and all other epifauna were identified and recovered using a modified SACFOR scale based on trawl area, length and efficiency.

Methodology for the underwater noise survey

8.3.9 Measurements of underwater background noise within the Tees estuary were taken by Subacoustech Environmental on 2 April 2014 and 3 April 2014. This was undertaken to inform an underwater noise modelling exercise that has been undertaken in response to comments made by Natural England in the Scoping Opinion which stated that this exercise is required to inform the assessment of potential impact on designated sites. This noise modelling has been used to inform a number of areas of the EIA, namely marine ecology, fisheries and waterbird populations. As illustrated on **Figure 8-5**, the estuary

was divided into four sections for the purposes of the underwater noise survey, with each section considered to have its own soundscape. The four sections were:

1. Transporter bridge to Tees Dock;
2. Tees Dock to the turning circle;
3. Seaton channel; and,
4. the area downstream of the turning circle to the mouth of the Tees estuary.

Measurements were taken at mid-water depth throughout the survey area, however measurements were concentrated in the area of the proposed scheme footprint. A static monitor buoy was also deployed during the survey at the locations shown in **Figure 8-5**.

Measurement equipment

Vessel based monitoring

8.3.10 All underwater sound vessel based measurements conducted as part of this study were undertaken using a Brüel and Kjær Type 8106 low noise hydrophone, which is able to measure underwater sound to levels well below sea state zero noise.

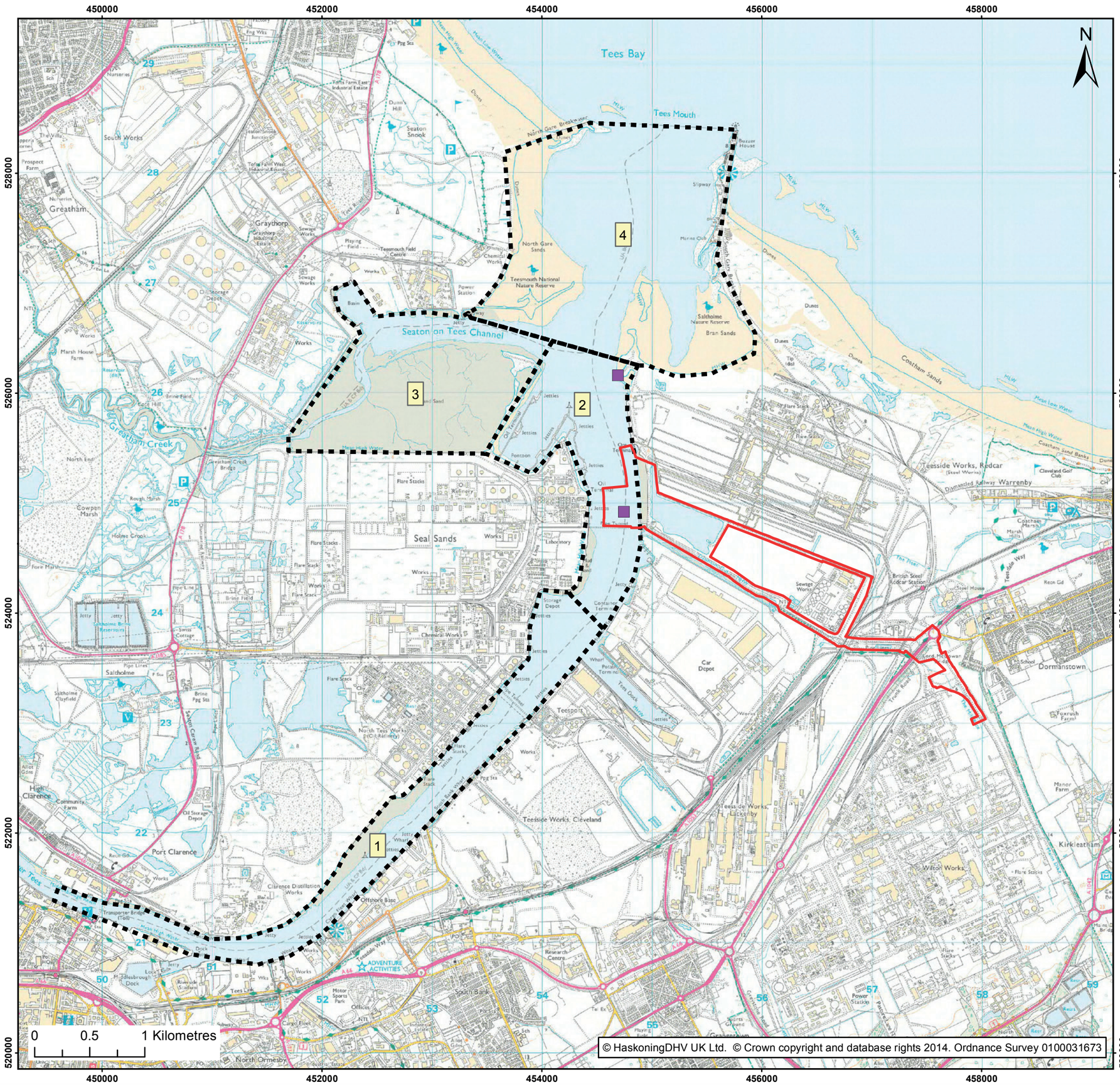
8.3.11 The Brüel and Kjær Type 8106 hydrophone has a linear sensitivity to underwater sound over the frequency range from 7 Hz to 80 kHz. The calibration chart for the sensor, traceable to International Standards, is provided in **Appendix 8.1**. Brüel and Kjær also provide sensitivity data outside of the linear range, from 0.25 Hz to 150 kHz, so that the acoustic data can be extended well beyond the linear frequency range specified above. This was corrected for on all the frequency spectra presented in this report.

8.3.12 All vessel-based underwater sound recordings undertaken in the course of the survey were digitised and stored on a portable laptop computer system at a sample rate of 350,000 samples per second. This provided useful acoustic data to a frequency of 175 kHz to be used. Subsequent analysis of the acoustic data was conducted over the frequency range from 1 Hz to 100 kHz. Spectral levels of noise have been presented over the frequency range from 1 Hz to 100 kHz.

Fixed location monitoring

8.3.13 All fixed location monitoring undertaken during the underwater noise survey was carried out using an Ocean Sonics icListen HF digital hydrophone. The icListen HF is also a low noise hydrophone that is able to measure underwater sound to levels well below sea state zero. The icListen HF hydrophone detects underwater sound pressure, amplifies and digitises the analogue signal storing the recorded sample as waveform and FFT (Fast Fourier Transform) data. The icListen HF was set up to sample 5 minutes of data every 15 minutes at a sample rate of 200 kHz, as well as automatically logging FFT data every second for frequencies up to 6 kHz.

8.3.14 Fixed location monitoring undertaken during this survey was carried out using an icListen HF suspended from a surface buoy which in turn was anchored by a weight resting on the seabed via a rope. It was placed at the edge of the dredged channel so that it did not interfere with shipping.



Legend:

- DCO Order Limits
- 1 Survey Area
- Static Monitor Deployment Locations

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title: Environmental Statement: Underwater Noise Measurement Areas Near Harbour Facilities

Part:	Figure:	Drawing No:
HF	8.5	9Y0989-HF-8-005

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
1	04/03/2015	LB	SR	A3	1:35,000
0	10/12/2014	LB	SR	A3	1:35,000

Co-ordinate system: British National Grid

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Measurement conditions

8.3.15 The survey was undertaken on board a chartered vessel, the J.B.1. The survey vessel was loaded with equipment and boarded near to the Transporter Bridge. **Table 8-4** shows the details of the tides for the days and times that the survey was undertaken. On both days the time of low tide was in the middle of the day. At high tide some of the area around Bran Sands was underwater as well as a larger area around Seaton Channel, compared to low tide. Low tide was in the middle of the day, so these areas were not accessible during the survey.

Table 8-4 Tide times and level above LAT during the underwater noise survey

Date	Tide	Time	Level above LAT (m)
02/04/2014	Low tide	00:09	0.4
	High tide	06:06	5.4
	Low tide	12:22	0.6
	High tide	18:18	5.6
03/04/2014	Low tide	00:45	0.7
	High tide	06:44	5.3
	Low tide	12:59	0.8
	High tide	19:00	5.3

8.3.16 Visibility was low during the survey due to mist, and as such, visibility of passing vessels was often limited. The wind speed was measured at regular intervals during the survey using a small handheld anemometer. A summary of the wind speeds recorded is shown in **Table 8-5**. The measured windspeed was fairly consistent throughout the two days of the survey, not exceeding 3m/s. On the morning of the second day the windspeed increased so that crests and wavelets were present. No windspeed measurements were able to be taken after 10:00am on 3 April 2014 to confirm this due to a malfunctioning anemometer. On the first day the icListen was deployed at 11:34am (all times in BST) and retrieved at 3:28pm, and on the second day it was deployed at 8:46 am and retrieved at 1:32pm.

Table 8-5 Details of measurements and prevailing conditions recorded during the survey

Date	Time	Wind speed	Direction
02/04/14	9:33	2.5	Westerly
	10:31	2.2	Westerly
	10:43	1.6	Westerly
	10:54	2.3	Westerly
	11:56	2.3	Westerly
	12:40	2.6	Westerly
	14:40	2.8	Westerly

Date	Time	Wind speed	Direction
03/04/14	9:08	2.3	Westerly
	9:45	2.7	Westerly

8.3.17 The results of the underwater noise assessment (presented in **Section 8.4**) have been, and will be, used to inform the impact assessment.

Underwater noise modelling

8.3.18 Underwater noise modelling was undertaken by Subacoustech during June 2014 to predict and assess the environmental impacts of underwater noise likely to be produced during the construction and operation phase of the proposed scheme (see **Appendix 8.2**). The methodology adopted for the underwater noise assessment was consistent with the latest guidance currently being developed as part of the implementation of the EU Marine Strategy Framework Directive.

8.3.19 That is, in order to estimate the underwater noise levels likely to arise during the construction of the proposed scheme, predictive underwater noise modelling was undertaken. The modelling was carried out using Subacoustech's INSPIRE model for impact piling. The openly available RAMSGeo software package was used to provide a comparison to INSPIRE, as well as modelling the underwater noise from dredging.

8.3.20 The INSPIRE model is a semi-empirical underwater noise propagation model based around a combination of numerical modelling and actual measured data. It is designed to calculate the propagation of noise in shallow, mixed coastal water, typical of coastal conditions around the UK. The model provides estimates of the unweighted peak, peak-to-peak and Root-Mean-Sound (RMS)[4] sound pressure level of noise along 180 equally spaced radial transects. Two modelling positions were chosen in order to show the greatest spatial range of results (i.e. the northern and southern extremities of the proposed port terminal, referred to as the North and South Position). The modelling assumed a pile diameter of 2m as a worst case scenario (for the solid quay option) and 914mm (for the open quay option); the assumed hammer energy was 125kJ and 305kJ respectively.

8.3.21 The RAMSGeo acoustic model is based on the well-known and much used Range-dependent Acoustic Model (RAM) software package (Collins 1994 and Collins *et al*. 1996). RAMSGeo is able to model any noise source where it is reasonable to assume it as a point source. As the INSPIRE model is predominantly used and set up to model impact piling noise, RAMSGeo has been used to model underwater noise from dredging. RAMSGeo was also used as a comparison to INSPIRE, to provide confidence in the INSPIRE model outputs.

8.3.22 RAMSGeo is a fully range dependant parabolic equation model that performs underwater acoustic transmission loss calculations. RAMSGeo is a purely theoretical model based solely around the physical acoustic processes that occur underwater. The software is widely used for the modelling of noise propagation since it:

[4] The RMS level is used to describe continuous sound and vibration, or signals that vary in level as opposed to impulsive sound. RMS levels are normally appropriate for characterising noise and vibration of a continuous nature such as drilling and background sea and river noise levels.

- models low frequency propagation well;
- allows for the incorporation of variable bathymetry; and,
- allows for the incorporation of complex estuary bottom types.

8.3.23 The variation of temperature throughout the water column can impact upon sound propagation. However, as the depth of water within the Tees estuary is relatively shallow and is well mixed, a uniform temperature profile was assumed within the RAMSGeo model. A representative sound speed of 1,470m/s was used within the underwater noise calculations. It was assumed within the model that the bed substrate was comprised of 65 to 70% silt, 20% clay, with sand and gravel providing the remainder (Halcrow, 1991). Consequently, the physical parameters presented within **Table 8-6** were used, as presented by Jensen *et al.* 1994.

Methodology for assessment of potential impacts

8.3.24 The methodology used to assess the potential environmental impacts associated with the proposed scheme is provided within **Section 4**.

Table 8-6 Physical parameters assumed within the RAMSGeo model

Parameter	Value
Sound speed ration C_p / C_w	1.1
Density ratio ρ_b / ρ_w	1.7
Compressional wave attenuation α_p	1.0
Shear wave attenuation α_s	1.5

8.3.25 Professional judgement has been used to determine potential environmental impacts which could arise during the construction, operational and decommissioning phases of the proposed scheme based on our existing knowledge of the sensitivity of the Tees estuary, gained from previous EIAs undertaken (i.e. NGCT, QEII Berth and Tees Dock No.1 Quay).

8.3.26 The findings of the EIA with regard to the hydrodynamic and sedimentary regime, marine sediment quality, water quality and noise are of relevance to this section and reference to these topics is made in this section.

Criteria used to assess the environmental effects of underwater noise arising from impact piling and dredging

8.3.27 In order to assess the environmental effects that impact piling and dredging activities are likely to have (with regard to underwater noise impacts to marine ecological species), the following metrics were used (discussed further below):

- Unweighted metrics (Parvin *et al*, 2007).
- The dB_{ht} (species) (Nedwell *et al*, 2007).
- M-Weighted SELs (Southall *et al*, 2007).

8.3.28 Parvin *et al* (2007) presents a comprehensive review of information on the lethal and physical impacts of underwater noise on marine receptors, and proposes the following criteria to assess the likelihood of these effects occurring:

- A lethal effect may occur where the peak noise level exceeds 240 dB re 1 µPA.
- Physical injury may occur where the peak noise level exceeds 220 dB re 1 µPA.

8.3.29 Unweighted noise metrics do not provide an indication of the impact that the sound would have upon a particular species. This is of fundamental importance when considering the impact of underwater noise on marine ecological receptors, as this is associated with the perceived loudness of the sound by that species. The same underwater sound, therefore, will affect marine species in a different manner depending upon the hearing sensitivity of that species.

8.3.30 The dB_{ht} (species) metric (Nedwell *et al*, 2007) incorporates this concept of 'loudness' for a species. The metric is built around a species' hearing ability by referencing the sound to the species' hearing threshold, and hence evaluates the level of sound a species can perceive. The perceived noise levels of source measured in dB_{ht} (species) are usually significantly lower than the unweighted levels as the sound would contain frequency components that the species could not detect. The species upon which the dB_{ht} (species) analysis was conducted as part of the underwater noise assessment was based upon regional significance, and also upon the availability of a good quality, peer reviewed audiogram. The marine mammal species considered within the assessment was harbour seal.

8.3.31 The assessment criteria presented in **Table 8-7** were published by the Department of Business, Enterprise and Regulatory Reform (BERR) (Nedwell *et al*, 2007) to assess the potential impact of underwater noise on marine species. In essence, Nedwell *et al* (2007) suggests the use of criteria which follow a similar approach as used to assess human response to noise.

Table 8-7 Assessment criteria used to assess the potential impact of underwater noise of marine species

Noise level in dB_{ht} (species)	Effect
Above 130	Possibility of traumatic hearing damage from a single event
90 and above	Strong avoidance reaction by virtually all individuals
75 and above	Some avoidance reaction by the majority of individuals, but habituation or context may limit effect. *
*In the presence of another biological imperative (such as migration to breeding or feeding grounds or avoiding a predator) individuals may not exhibit any behavioural reaction to the noise source.	

8.3.32 Southall *et al (*2007) presents a set of interim criteria for the levels of underwater noise that may lead to auditory injury in marine mammals based on M-weighted sound exposure levels (SELs) and peak Sound Pressure Levels (SPLs). Instead of using species specific audiograms to determine hearing sensitivity in marine mammals (as is the case of the dB_{ht} (species)), the criteria proposed by Southall *et al* (2007) groups marine mammals into four main "M-Weighting" groups. These groups are low, mid and high frequency cetaceans and pinnipeds (in water). The criteria are presented in **Table 8-8**.

Table 8-8 Proposed injury criteria for various marine mammal groups (Southall *et al*, 2007)

Marine mammal group	Sound type		
	Single pulse	Multiple pulse	Non-pulses
Low, mid and high frequency cetaceans			
SPL	230 dB re 1 µPa (peak)	230 dB re 1 µPa (peak)	230 dB re 1 µPa (peak)
SEL	198 dB re 1 µPa2^{s} (M)	198 dB re 1 µPa2^{s} (M)	215 dB re 1 µPa2^{s} (M)
Pinnipeds (in water)			
SPL	218 dB re 1 µPa (peak)	218 dB re 1 µPa (peak)	218 dB re 1 µPa (peak)
SEL	186 dB re 1 µPa2^{s} (M)	186 dB re 1 µPa2^{s} (M)	203 dB re 1 µPa2^{s} (M)

8.4 Existing environment

8.4.1 The Tees estuary comprises intertidal sand and mudflats, rocky shore, saltmarsh and sand dunes. The estuary has been significantly modified over the last 150 years by activities such as land claim, construction of breakwaters and training walls. Over 80% of the intertidal sedimentary habitats of the Tees estuary have been reclaimed over this period.

8.4.2 The remaining intertidal areas in the Tees estuary are typically composed of mud and sand, with mats of *Enteromorpha* sp. on sheltered mudflats (notably at Seal Sands). The strand-line and foreshores of North and South Gare (either side of the estuary mouth) and the mudflats of Seal Sands and Bran Sands are backed by their respective dune systems and series of open wet grasslands at Seaton Common and on Cowpen Marsh.

Summary of QEII jetty refurbishment benthic survey

8.4.3 A benthic survey undertaken during December 2008 in support of the QEII Berth EIA demonstrated that the biological communities within the footprint of the proposed QEII Berth development were of relatively low diversity, broadly characterised of chemically or physically disturbed conditions and very similar in faunal composition to previously surveyed fine sediment locations within the estuary (Royal Haskoning, 2009). The results indicated light to moderate levels of existing pollution impact, with the infaunal communities possibly undergoing a slow recovery from a prolonged period of historical impacts from past use in the vicinity. Samples contained no vulnerable or rare species, or any of known conservation interest.

Summary of the NCGT benthic survey

8.4.4 A benthic survey of the lower Tees estuary was undertaken during 2006 to inform the EIA undertaken for the NGCT. The survey identified that subtidal sediments comprised high silt/clay content in the main approach channel, becoming more sandy at the mouth of the estuary. The invertebrate infauna in the main channel was dominated by polychaetes, with *Chone* sp. and *Ophryotrocha* sp. present. Bivalves, including *Abra alba*, were also present at locations within the dredged channel. The infaunal community in the main channel was dominated by a low number of species suggesting that this assemblage is largely made up of opportunistic species which colonise the area in between

maintenance dredging programmes. At near-shore and undredged locations, the opportunistic *Ophryotrocha* sp. and *Capitella capitata* dominated, indicating some level of organic enrichment in these areas. Towards the mouth of the estuary, in the sandy sediments, the infauna was dominated by the polychaetes *Chaetozone christiei* and *Spio decorata*, crustaceans (e.g. *Diastylis bradyi*) and molluscs (e.g. *Abra alba*) were also present.

8.4.5 The benthic survey carried out for the NGCT ES also described the epifaunal communities in the lower Tees Estuary. Trawls showed a greater species abundance and diversity in the area between Dabholm Gut and Seaton Channel, with trawls between Tees Dock and Dabholm Gut and at the mouth of the estuary yielding very little epifauna (Royal Haskoning, 2006). The most abundant species were the shrimp *Crangon* spp. and the shore crab *Carcinus maenus*. The brittle star *Ophiura albida* was also relatively abundant in some trawls.

Summary of Environment Agency benthic survey data

8.4.6 The Environment Agency has provided benthic invertebrate data for a number of sampling stations in the Tees estuary (see **Figure 8-2**). The most recent available data for these stations is summarised below:

- Bamletts Bight (April 2011);
- Laings Basin (September 2011);
- Seal Sands (October 2011);
- Seaton Snook (September 2011);
- Tioxide Outfall (October 2011); and,
- Tees TW WFD (April 2013).

8.4.7 The following presents a summary of the most recent benthic data from each of the above stations.

- Bamletts Bight (April 2011)

8.4.8 This station was characterised by oligochaete and polychaete worms, with *Scalibregma inflatum, Streblospio shrubsolii, Tubificoides benedii, Tubificoides pseudogaster* and Sabellidae being numerically dominant. These species are typically associated with estuarine sedimentary habitats.

- Laings Basin (September 2011)

8.4.9 The polychaetes *Cossura longocirrata, Tharyx* and *Chaetozone vivipara* dominated this station, with the oligochaete *Tubificoides pseudogaster* also present.

- Seal Sands (October 2011)

8.4.10 A range of polychaetes and oligochaetes characterised the Seal Sands station, with the cockle *Cerastoderma* also present.

- Seaton Snook (September 2011)

8.4.11 Polychaetes and oligochaetes dominated this station, with a small number of cockles *Cerastoderma* and mussels *Mytilidae* also present.

- Tioxide Outfall (October 2011)

8.4.12 Oligochaetes were numerically dominant at this station, particularly *Tubificoides benedii, Tubificoides pseudogaster* and *Tubificoides galiciensis*. A range of polychaetes were also present, notably the opportunistic species *Capitella capitata*.

- Tees TW WFD (April 2013)

8.4.13 This station appears to be the most species rich of the sampled stations and is dominated by polychaete and oligochaete worms. Notably high densities of the polychaetes *Ophryotrocha* and *Euchone* were recorded from this station.

Summary of data recovered during the benthic ecology survey, 2014

Infauna

8.4.14 The full report of the benthic ecology survey is provided in **Appendix 8.3**. **Figure 8-6** summarises the findings of the benthic infaunal survey in the form of a biotope map. Biotopes are assigned on the basis of the results of the multivariate statistical analysis of the infaunal data (as described in **Appendix 8.3**).

8.4.15 The dominant biotope complex was SS.SMU.ISaMu (Infralittoral sandy mud) (see **Figure 8-6**). This is consistent with the results from the particle size analysis. The non-native species *Euchone limnicola* was very characteristic of this habitat in the survey area.

8.4.16 Site AC04 is an intertidal location upstream of the site of the proposed port terminal and best fitted the biotope complex LS.LSa.MuSa (Polychaete / bivalve dominated muddy sand shores).

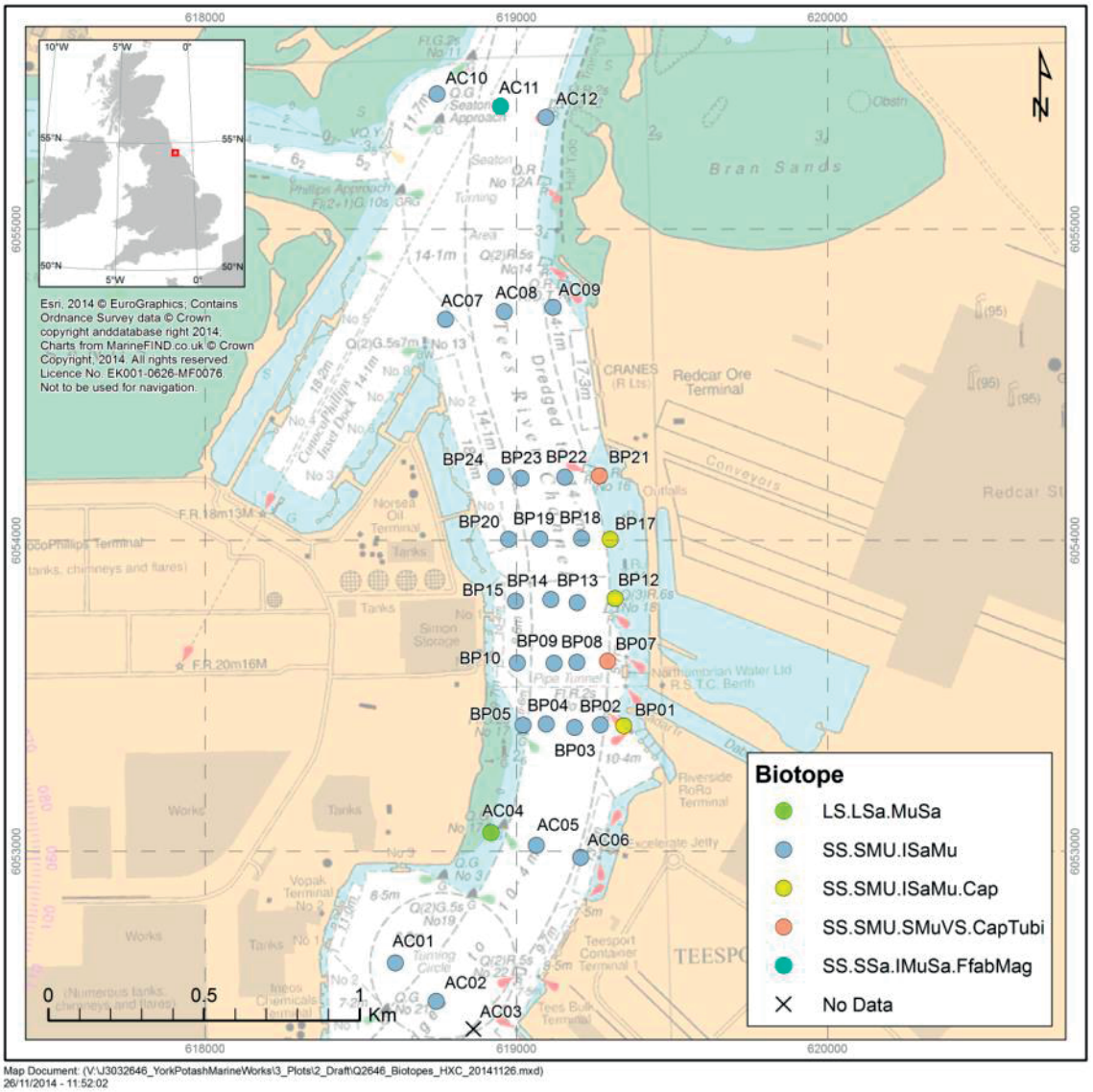
8.4.17 The biotope at BP01, BP12 and BP17 was best described as SS.SMU.ISaMu.Cap (*Capitella capitata* in enriched sublittoral muddy sediments). Connor *et al.* (2004) note the presence of this biotope in the Tees estuary and that it can be accompanied by large numbers of the small polychaeta, *Ophryotrocha* (as in this case). The community at BP07 and BP21 was a similar biotope, SS.SMU.SMuVS.CapTubi (*Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment). This was identified in the same area as SS.SMU.ISaMu.Cap but is a more species rich habitat with less dominance from *Capitella* and fewer *Ophryotrocha*. Both these biotopes were also characterised by the oligochaete *Limnodrilus* which is not typical for these biotopes.

8.4.18 Site AC11 in mid channel at the mouth of the Tees was identified as SS.SSA.IMuSa.FfabMag (*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand). This was the location with the greatest number of taxa recorded and the only location characterised by the bean-like tellin *Tellina fabula* (previously *Fabulina fabula*).

8.4.19 The macrobenthic communities sampled are typical of the Tees estuary, with annelids dominating in terms of the number of taxa, abundances and biomass. The opportunistic species *Capitella* was the most abundant species recorded with 97% of the total abundance for the taxon attributable to just two sites, BP12 and BP17. The biotope identified for these locations was SS.SMu.ISaMu.Cap (*Capitella capitata* in enriched sublittoral muddy sediments), the occurrence of which in the Tees estuary has

been reported by Connor et al., (2004). It is worth noting that both these sites occur downstream of the Dabholm Gut which receives sewage inputs from the NWL sewage treatment plant.

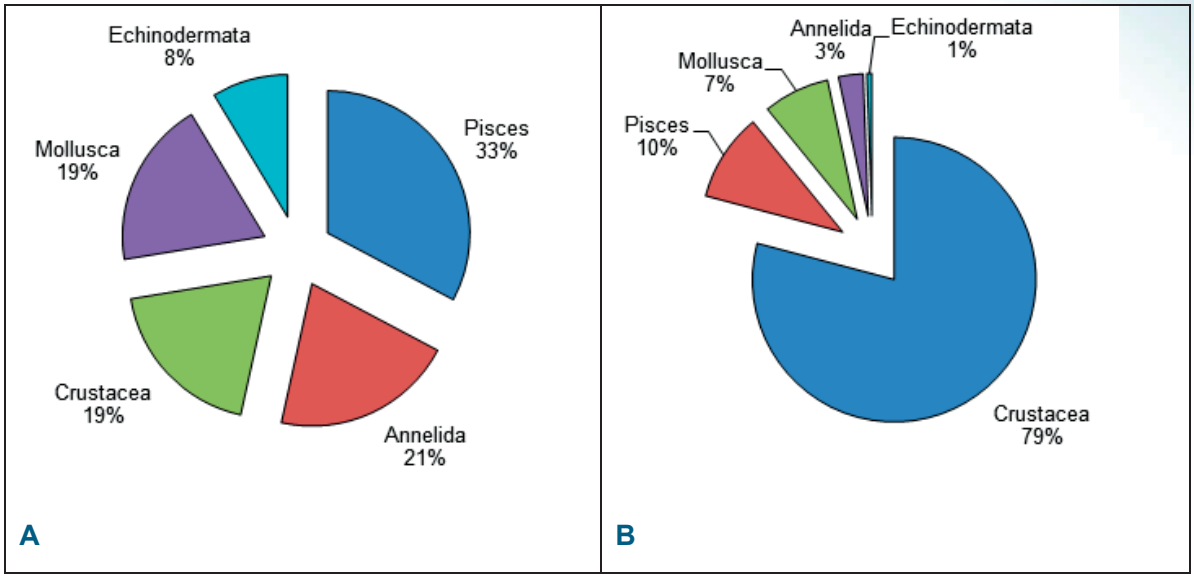
Figure 8-6 Biotope distribution across the survey area



Epifauna

8.4.20 A total of 58 species were identified from the contents of the 10 trawls. The most common epibenthic group sampled accounting for a third of the taxa recorded was fish (Pisces) (**Figure 8-7).** This was followed by Annelida (21%), Crustacea (19%), Mollusca (19%) and Echinodermata (8%). In terms of the number of individuals, Crustacea dominated accounting for 89% of the total abundance. Fish accounted for a further 10% followed by Mollusca (7%), Annelida (3%) and Echinodermata (1%).

Figure 8-7 Percentage contributions of major taxonomic groups to the total number of taxa recorded (A) to the total abundance (B)



8.4.21 The top ten most abundant species and the frequency with which they were encountered within the 2m beam trawl samples are presented in **Table 8-9**. The brown shrimp was the most numerous species accounting for 72% of all individuals caught and was recorded from all ten trawls. Flatfish were the second most numerous species encountered and again occurred at all trawl sites.

Table 8-9 Total abundance and frequency of the ten most abundant taxa recorded from the 2m beam trawl survey

Species	Common name	Total abundance	No. of trawls
Crangon crangon	Brown shrimp	7468	10
Pleuronectidae	Flatfish	859	10
Abra alba	Bivalve mollusc	488	8
Carcinus maenas	Shore crab	373	9
Abra nitida	Bivalve mollusc	251	6
Nephtys hombergii	Cat worm	163	8
Pandalus montagui	Pink shrimp	158	7
Liocarcinus holsatus	Flying crab	136	8
Terebellides stroemii	Polychaete worm	89	3
Gadus morhua	Cod	82	6

Intertidal area at the location of the proposed port terminal

8.4.22 Intertidal areas (which can be sedimentary, such as sand and mudflat, or rocky habitats) represent important marine and estuarine habitat and generally have a high abundance of species. They are typically highly productive areas which support predatory birds and fish. Within the Tees estuary, the extent of intertidal habitat has been significantly reduced as the banks of the estuary have been developed. Existing areas of intertidal habitat, especially intertidal mudflat, within the Tees estuary are fragmented and, in this context, intertidal areas are a sensitive resource.

8.4.23 'Intertidal mudflat' is a UK Biodiversity Action Plan (BAP) priority habitat. In 2012, the UK BAP was succeeded by the UK Post-2010 Biodiversity Framework, but the UK list of priority BAP habitats remains an important reference source. The current Tees Valley Local BAP covers the local authority areas of Hartlepool, Stockton, Middlesbrough and Redcar and Cleveland, and the Tees Valley Biodiversity Partnership carried out a review of local priority habitats and species within the region in 2011. Listed habitats and species of relevance to the proposed scheme comprise mudflat and saltmarsh, saline lagoons and harbour seals.

8.4.24 An intertidal area, shown in **Plate 8-1, Plate 8-2, Plate 8-3** and **Plate 8-4** below (photographs taken on 17 April 2014 by INCA during a spring tide (0.8m above LAT on the day of the site visit)) is present within the footprint of the proposed port terminal. As can be seen in the photographs, the surface of the intertidal area consists of a mixture of bricks, rubble, road planings and gabions with areas of mud and standing water. It is estimated that this intertidal area comprises approximately 60-70% hard substrata and 30-40% mud.

8.4.25 The nature of the substratum present at this location has been assessed (together with its functioning in terms of inundation, tidal exposure and waterbird usage (described in Section 9.4)) in order to understand its intrinsic value as a habitat in the context of the estuarine system and its role in supporting waterbirds. In terms of conspicuous species, the hard substrata present is colonised by small mussels, fucoid algae, limpets and barnacles. Notably, a significant area of the intertidal is permanently inundated (even on the lowest spring tides) due to water draining from Bran Sands lagoon being retained by the training wall that runs along the lower part of the intertidal (visible on **Plate 8-2**).

8.4.26 The habitat present is considered to be of low quality and this is demonstrated by the fact that there is a consistently low level of usage of this area when the intertidal area is exposed and available for waterbird feeding (see **Section 9.4**). Typically, areas that are infrequently exposed, as is the case in this location, are well used by waterbirds because the invertebrate community is not well predated.

8.4.27 In the context of 'intertidal mudflat' as a BAP priority habitat, because the mud that is present (no saltmarsh or saline lagoons are present) in the intertidal area within the proposed footprint of the port terminal is of such a degraded quality, this area is not considered to represent a BAP priority habitat.

Plate 8-1 Intertidal area at the site of the proposed port terminal (looking seaward/downstream) (photo courtesy of INCA)

Plate 8-2 Intertidal area at the site of the proposed port terminal (looking landward/upstream) (photo courtesy of INCA)

Plate 8-3 Upper intertidal area at the site of the proposed port terminal (looking landward/upstream) (photo courtesy of INCA)

Plate 8-4 Intertidal area at the site of the proposed port terminal (looking across the estuary) (photo courtesy of INCA)

Designated sites for nature conservation

8.4.28 Although the proposed scheme footprint is not located within a designated site for nature conservation, a large proportion of the Tees estuary has been recognised for its nature conservation value through national and international designations. The designated sites for nature conservation within the study area (see **Figure 8-8**) are:

- Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site;
- Tees and Hartlepool Foreshore and Wetlands (Site of Special Scientific Interest (SSSI));
- Teesmouth National Nature Reserve (NNR);
- Seal Sands SSSI;
- Cowpen Marsh SSSI;
- Redcar Rocks SSSI;
- Seaton Dunes and Common SSSI; and,
- South Gare and Coatham Sands SSSI.

8.4.29 These sites are predominantly designated for their ability to support important waterbird populations. However, some of the above sites are also designated for marine mammals and marine and coastal flora, in addition to waterbird populations, as presented below. The interest features of the SPA and Ramsar site (and the waterbird interest of the other sites listed above) are presented in full within **Section 9.4**.

Teesmouth National Nature Reserve

8.4.30 The Teesmouth NNR is divided into two sections, namely North Gare and Seal Sands. North Gare is an area of dunes and grazing marsh, whilst Seal Sands is one of the largest areas of intertidal mudflat on England's north-east coast. North Gare is of importance given its ability to support overwintering birds. At Seal Sands, a colony of harbour seals haul out on the sand banks at low tide. The seals also utilise the intertidal mudflat as a breeding ground for pups.

Cowpen Marsh SSSI

8.4.31 The site known as Cowpen Marsh includes the largest saltmarsh between Lindisfarne and the Humber estuary.

8.4.32 Along the southern side of Greatham Creek the saltmarsh is dominated by common saltmarsh grass *Puccinellia maritima* with sea aster *Aster tripolium*. More elevated sections of the saltmarsh support species-rich associations of red fescue *Festuca rubra*, sea plantain *Plantago maritima*, sea arrowgrass *Triglochin maritima*, greater sea-spurry *Spergularia media* and sea milkwort *Glaux maritima* and there is an unusual community of common sea-lavender *Limonium vulgare* with thrift *Armeria maritima* which occurs close to the northern limit of its range in eastern Britain. To the north of Greatham Creek, pioneer communities of glasswort *Salicornia* spp. and annual seablite on the intertidal mud are succeeded by common saltmarsh-grass and sea aster.

Seaton Dunes and Common SSSI

8.4.33 Seaton Dunes and Common is an area of considerable importance for its flora, invertebrate fauna, and bird life. The range of habitats present include sandy, muddy and rocky foreshore, dunes, dune slacks

and dune grassland, as well as relict saltmarsh, grazed freshwater marsh with dykes (known locally as fleets and stells) pools and seawalls.

8.4.34 Marram grass *Ammophila arenaria* dominates the main dunes with large populations of sea lyme grass *Elymus arenarius*, sand couch *Agropyron junceiforme* and sea rocket *Cakile maritima* on their seaward side. The dune flora is particularly rich and includes the nationally rare rush-leaved fescue *Festuca juncifolia* and sea couch *Agrophyron pungens* and its northernmost locality, as well as purple milk vetch *Astragalus danicus*, blue fleabane *Erigeron acer* and yellow wort *Blackstonia perfoliata* which have a limited distribution and are associated with the lime-rich slag of the dune covered sea walls.

South Gare and Coatham Sands SSSI

8.4.35 The sand dunes at South Gare and Coatham Sands are dominated by marram grass *Ammophila arenaria* in addition to supporting one of the largest continuous stands of lyme grass *Leymus arenarius* in Britain. Sea couch-grass *Elymus pycnanthus* is present within the site at the northern limit of its range.

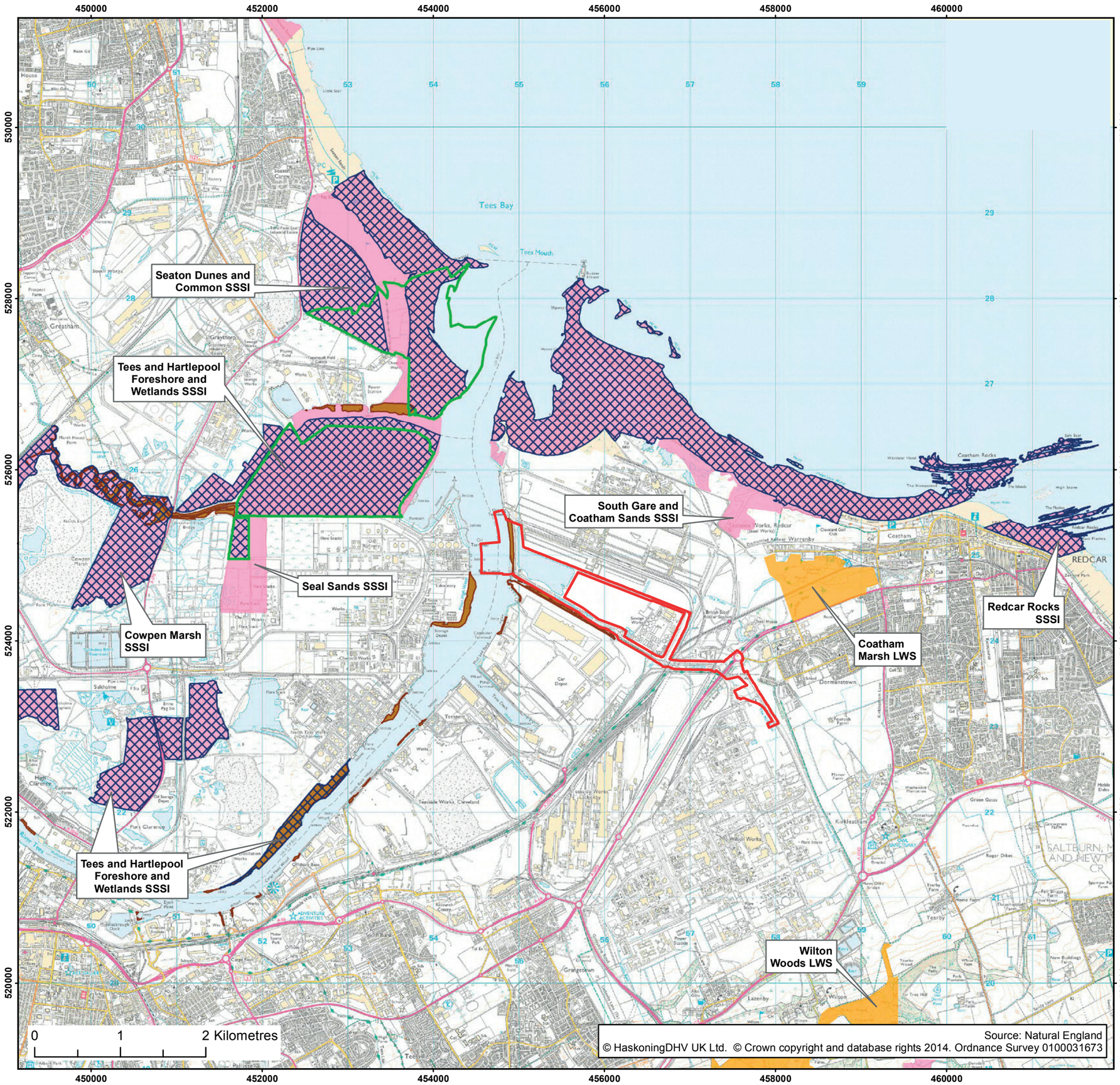
8.4.36 The dune slacks support large populations of northern marsh orchid *Dactylorhiza purpurella*, early marsh orchid *D. incarnata* and fragrant orchid *Gymnadenia conopsea*. Other plants of particular interest within the dune system, and associated with lime-rich areas of tipped slag, are yellow wort *Blackstonia perfoliata*, lesser centaury *Centaurium pulchellum*, knotted hedge parsley *Torilis nodosa*, carline thistle *Carlina vulgaris*, strawberry clover *Trifolium fragiferum* and the nationally rare grass, rush-leaved fescue *Festuca juncifolia*.

8.4.37 Within the developing saltmarsh notable plants include sea wormwood *Artemisia maritima*, lesser sea spurrey *Spergularia marina*, lax-flowered sea lavender *Limonium humile*, sea purslane *Halimione portulacoides* and smallest hare's ear *Bupleurum tenuissimum*. Parsley water dropwort *Oenanthe lachenalii* is of particular interest amongst the fresh water marsh communities dominated by great reedmace *Typha latifolia*, rushes *Juncus* spp. and sedges *Carex* spp.

Local Wildlife Sites

8.4.38 Local Wildlife Sites (LWSs) are selected for their local nature conservation value. LWSs can contain important, distinctive and threatened habitats and species. In many parts of the UK, they are the principal wildlife resource but their designation is non-statutory and their only protection comes via the planning system.

8.4.39 Consultation with INCA during April 2014 has identified that the closest LWS to the proposed scheme footprint is the Coatham Marsh site, which has been managed by the Tees Valley Wildlife Trust since 1982. The Coatham Marsh LWS is located approximately 1.1km north east of the proposed scheme footprint at its closest point, and is comprised of a series of pools and reed-swamp which has survived the urbanisation and industrialisation of the Tees estuary. The site is of regional importance for wintering birds and local importance for its breeding bird population.



Legend:

- DCO Order Limits
- Local Wildlife Sites
- Teesmouth National Nature Reserve
- Teesmouth and Cleveland and Coast Ramsar & SPA
- Sites of Special Scientific Interest (SSSI)
- Mudflat*

* The intertidal area within the DCO Order Limits is classified as a mudflat in the dataset but this area is not considered to be a mudflat (refer to Section 8 of the Environmental Statement)

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title:

Environmental Statement: Designated Sites for Nature Conservation Near Harbour Facilities

Part:	Figure:	Drawing No:
HF	8.8	9Y0989-HF-8-006

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
1	04/03/2015	JE	SR	A3	1:45,000
0	09/12/2014	JE	SR	A3	1:45,000

Co-ordinate system: British National Grid

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8.4.40 The Wilton Woods LWS is the next closest locally designated wildlife site to the proposed scheme footprint. The Wilton Woods LWS is located approximately 3.7km south of the proposed scheme footprint at its closest point, and is comprised of an extensive mixed woodland complex of ancient woodland, broad leaved woodland and re-planted ancient woodland mosaic. The complex is one of the best sites in the Tees Valley for land molluscs, a primary indicator of ancient woodland. The location of LWS in relation to the proposed scheme footprint is illustrated on **Figure 8-8**.

8.4.41 LWSs have not been considered further within this section of the ES, given the interest features for which the sites have been designated and the geographic separation between the LWSs and the footprint of the proposed scheme.

Marine mammals

8.4.42 Seal Sands is an important haul-out site for both common (harbour) seals *Phoca vitulina* and grey seals *Halichoerus grypus*, and is also the only breeding site for common seals on the east coast between the Wash and the Tay. Both the common seal and grey seal are listed as vulnerable under the EC Habitats Directive. INCA has been monitoring the seal population at Seal Sands since 1989, with the most intensive monitoring being undertaken during the common seal pupping season (between early June and late August).

8.4.43 **Figure 8-9** shows the key haul out sites used by marine mammals at Seal Sands. Site 'A', 'B', 'E' and 'The Wall' are used mainly by common seals, while Site 'D' is used by grey seals. Site 'C' and 'The Spit' are used by both species (INCA, 2012).

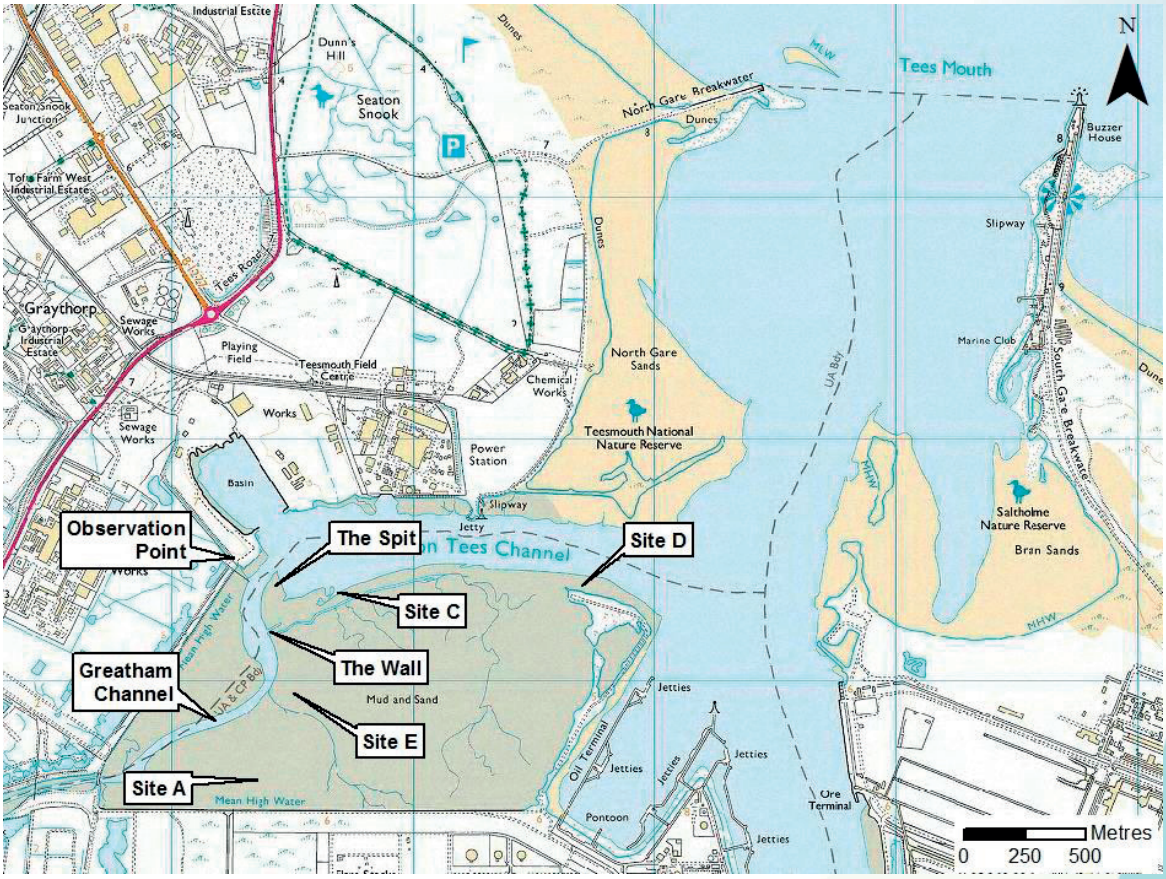
8.4.44 The 2013 season saw the birth of 23 harbour seal pups, which continues the upward trend in pup births which has been evident in recent years. Of the 23 harbour seal pups which were born during 2013, 22 survived with only one still born pup. The result from 2013 was also significant as INCAs dedicated seal monitors observed two seal births on the saltmarsh at Greatham Creek. These are the first two seal pup births that are known to have taken place at that location. The maximum daily number of harbour seal recorded within the Tees estuary peaked at 103 during early September 2013. This exceeds the previous record from 2012 by 17% (INCA, 2013).

Notable habitats and species

8.4.45 Section 41 of the Natural Environment and Rural Communities Act 2006 requires the Secretary of State to publish a list of habitat and species which are of principal importance for the conservation of biodiversity in England. The Section 41 list is used to guide decision makers in implementing their duty under Section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England when carrying out their normal functions. A total of 56 habitats of principal importance and 943 species of principal importance are included on the Section 41 list.

8.4.46 The survey did not detect the presence of species of principal importance within and in the vicinity of the footprint of the proposed scheme. However, common seal are present within the Tees estuary and this species is included on the list of species of principal importance.

Figure 8-9 Location of seal haul out sites on Seal Sands



8.4.47 Juvenile ocean quahog, *Arctica islandica*, were recorded at six stations throughout the survey area (AC08, AC11, BP02, BP04, BP05 and BP15) (no adults were recorded). *A. islandica* is on the OSPAR list of 'Threatened and/or Declining Habitats and Species'. In England, it is on the marine conservation zone (MCZ) species list of 'Features of Conservation Interest' (FOCI) created under Part 5 of the Marine and Coastal Access Act 2009. The MCZ ecological network guidance (NE and JNCC, 2010), recommends that the species *"be protected within marine protected areas in each regional MCZ project area, where they occur"*. The survey area does not fall within any designated marine protected area.

8.4.48 The Tees estuary contains habitats of principal importance listed within Section 41 of the Natural Environment and Rural Communities Act 2006, including intertidal mudflats and saline lagoons, but these are not located in the vicinity of the site of the proposed scheme.

Summary of underwater noise survey

8.4.49 The measurements recorded during the underwater noise survey have been analysed to determine the SPLs, and identify the main contributing sources of noise that make up the ambient noise environment in the vicinity of the proposed port terminal.

8.4.50 The underwater noise survey identified that the level of noise was typically in the region of 115 to 120 dB re 1 µPa RMS down the centre of the river. This is considered to be a fairly high level for a wide,

slow flowing river. Seaton Channel was found to be relatively quiet by comparison, with the exception of the noise generated by the water intakes for the nuclear plant.

8.4.51 The data identified that existing shipping activity was the main source of underwater noise within the Tees estuary. High frequency noise from many ships' echosounders was detected during the survey, as well as noise from generators on-board moored ships. Due to its ubiquity, the noise from shipping was by far the largest source and was detectable throughout the main channel with the estuary.

8.4.52 **Table 8-10** shows the maximum, minimum and mean SPL from each area during both days of the survey, analysed in terms of the hearing abilities of bottlenose dolphin, harbour porpoise and harbour seal (these species were specifically selected given their regional importance and also the availability of a good quality peer reviewed audiogram for such species).

Table 8-10 RMS levels for marine mammals for each measurement area

		RMS dB_{ht}(*Species*)					
		02-04-14			03-04-14		
Area		Bottlenose Dolphin	Harbour Porpoise	Harbour Seal	Bottlenose Dolphin	Harbour Porpoise	Harbour Seal
1	Max	66.4	74.4	46.0	62.5	70.2	52.7
	Min	37.1	50.6	30.2	37.8	50.9	26.4
	Mean	51.0	60.0	38.3	47.3	56.7	42.8
2	Max	67.5	77.3	55.3	71.3	79.0	59.2
	Min	37.6	46.1	28.0	31.6	39.6	28.7
	Mean	49.5	58.7	41.3	47.5	56.9	41.4
3	Max	67.0	73.6	61.0	54.8	61.8	47.7
	Min	34.7	45.3	16.1	37.0	46.6	24.4
	Mean	43.3	53.6	33.1	43.4	53.5	31.6
4	Max	53.9	60.5	53.3	51.9	60.9	39.0
	Min	38.3	50.9	32.0	37.3	51.7	27.0
	Mean	44.9	54.3	42.1	42.8	54.3	29.8
Overall	Max	67.5	77.3	61.0	71.3	79.0	59.2
	Min	34.7	45.3	16.1	31.6	39.6	24.4
	Mean	48.3	57.6	39.6	46.5	56.3	39.4

8.4.53 The mean dB_{ht} levels for marine mammals as presented in **Table 8-10** are in keeping with levels in coastal areas which are generally in the range of 30 to 65dB_{ht}.

8.4.54 Generally, baseline noise levels were below 50dB_{ht} for all species considered, suggesting that there is a low likelihood that the ambient noise levels in the area will cause any reaction for these species. The highest levels were noted for the harbour porpoise, where the maximum noise level as a vessel passed reached just over 75dB_{ht}. This can be considered the level at which some aversive reaction could

occur, although this noise level is transient and any reaction is unlikely to be sustained. Therefore the existing ambient noise levels and their continuous (as opposed to impulsive) nature are unlikely to result in any significant reaction or aversive behaviour in native species.

Summary of underwater noise modelling results

Modelling of impact piling

8.4.55 The modelling results presented in **Table 8-11** and **Table 8-12** provide a summary of the estimated ranges out to which certain unweighted levels of noise are expected to occur from a 914mm diameter and 2000mm diameter impact pile respectively.

Table 8-11 Summary of modelled ranges for unweighted peak-to-peak SPLs for impact piling for a 914mm diameter pile

Impact piling	North location			South location		
	Maximum range	Minimum range	Mean range	Maximum range	Minimum range	Mean range
220 dB re 1 µPa	6m	4m	5m	6m	4m	5m
200 dB re 1 µPa	42m	24m	37m	54m	20m	43m
190 dB re 1 µPa	160m	24m*	94m	210m	20m*	120m
180 dB re 1 µPa	600m	24m*	280m	760m	20m*	340m
170 dB re 1 µPa	1930m	24m*	480m	2400m	20m*	550m
160 dB re 1 µPa	2750m**	24m*	510m	4900m**	20m*	630m

Table 8-12 Summary of modelled ranges for unweighted peak-to-peak SPLs for impact piling for a 2000mm diameter pile

Impact piling	North location			South location		
	Maximum range	Minimum range	Mean range	Maximum range	Minimum range	Mean range
220 dB re 1 µPa	14m	10m	12m	16m	12m	13m
200 dB re 1 µPa	150m	24m	88m	190m	20m*	120m
190 dB re 1 µPa	560m	24m*	260m	700m	20m*	330m
180 dB re 1 µPa	1800m	24m*	470m	2300m	20m*	550m
170 dB re 1 µPa	2750m**	24m*	500m	4900m**	20m*	630m
160 dB re 1 µPa	2750m**	24m*	510m	4900m**	20m*	630m

8.4.56 The data presented in **Table 8-11** and **Table 8-12** show that the propagation of noise from the North and South positions is similar for both pile diameters, until the point at which the sound drops below approximately 170 dB re 1 µPa, where the bathymetry of the estuary starts to impact upon the noise propagation. It should also be noted that in the case of both modelling locations, the minimum range reaches a limit of 24m and 20m at the North and South positions respectively (this range, marked by an asterisk in **Table 8-11**, is the shortest distance from the modelling location to the river bank). Equally,

the maximum range was predicted to reach a limit (2750m at the north location and 4900m at the south location) where the modelled sound reaches the river bank (marked by a double asterisk). Contour plots illustrating the unweighted peak-to-peak SPLs for impact piling are presented in **Figures 8-10** to **8-13**.

Figure 8-10 Contour plot showing the predicted unweighted peak-to-peak SPLs from impact piling of a 914mm diameter pile at the North position

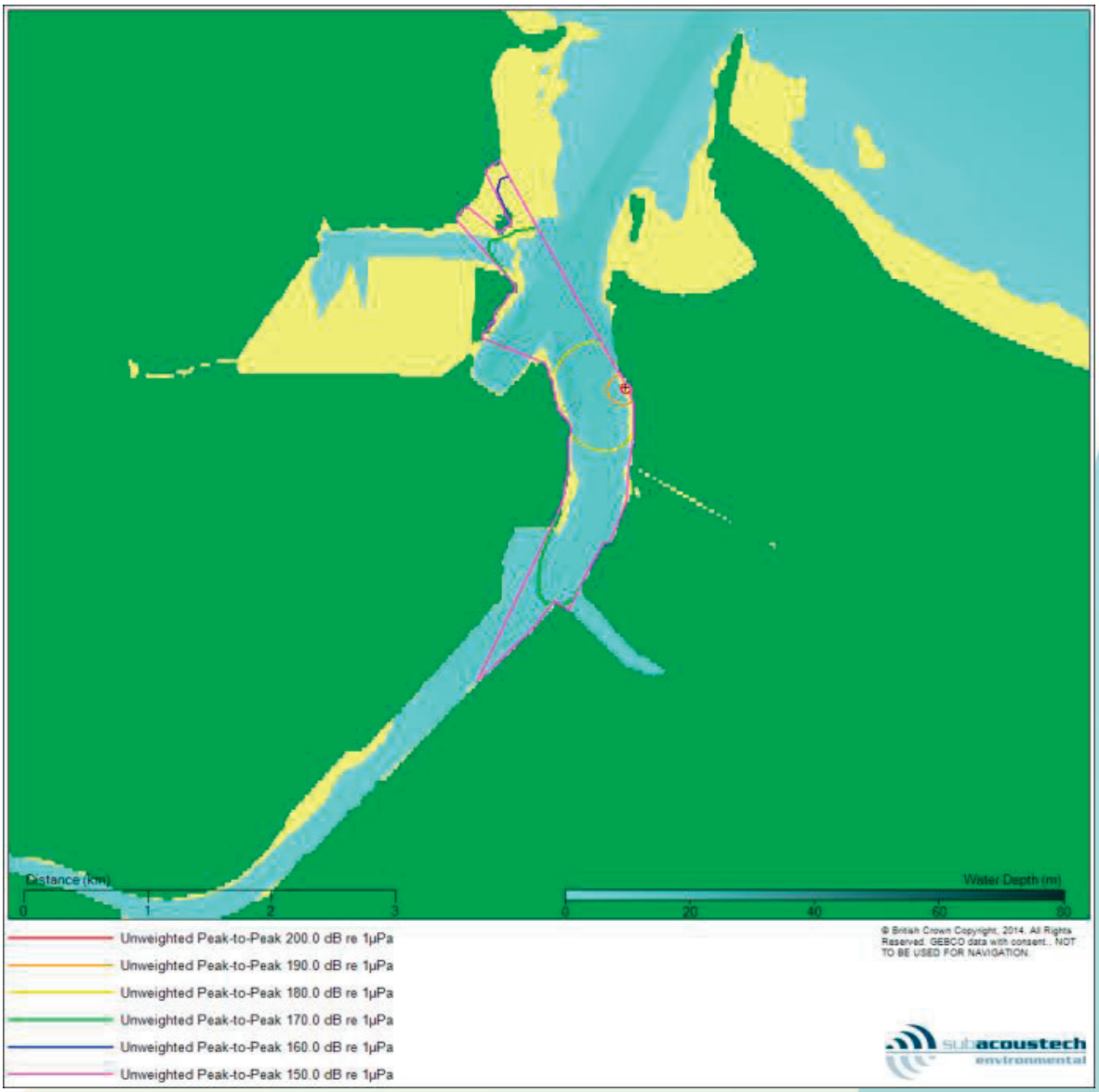


Figure 8-11 Contour plot showing the predicted unweighted peak-to-peak SPLs from impact piling of a 914mm diameter pile at the South position

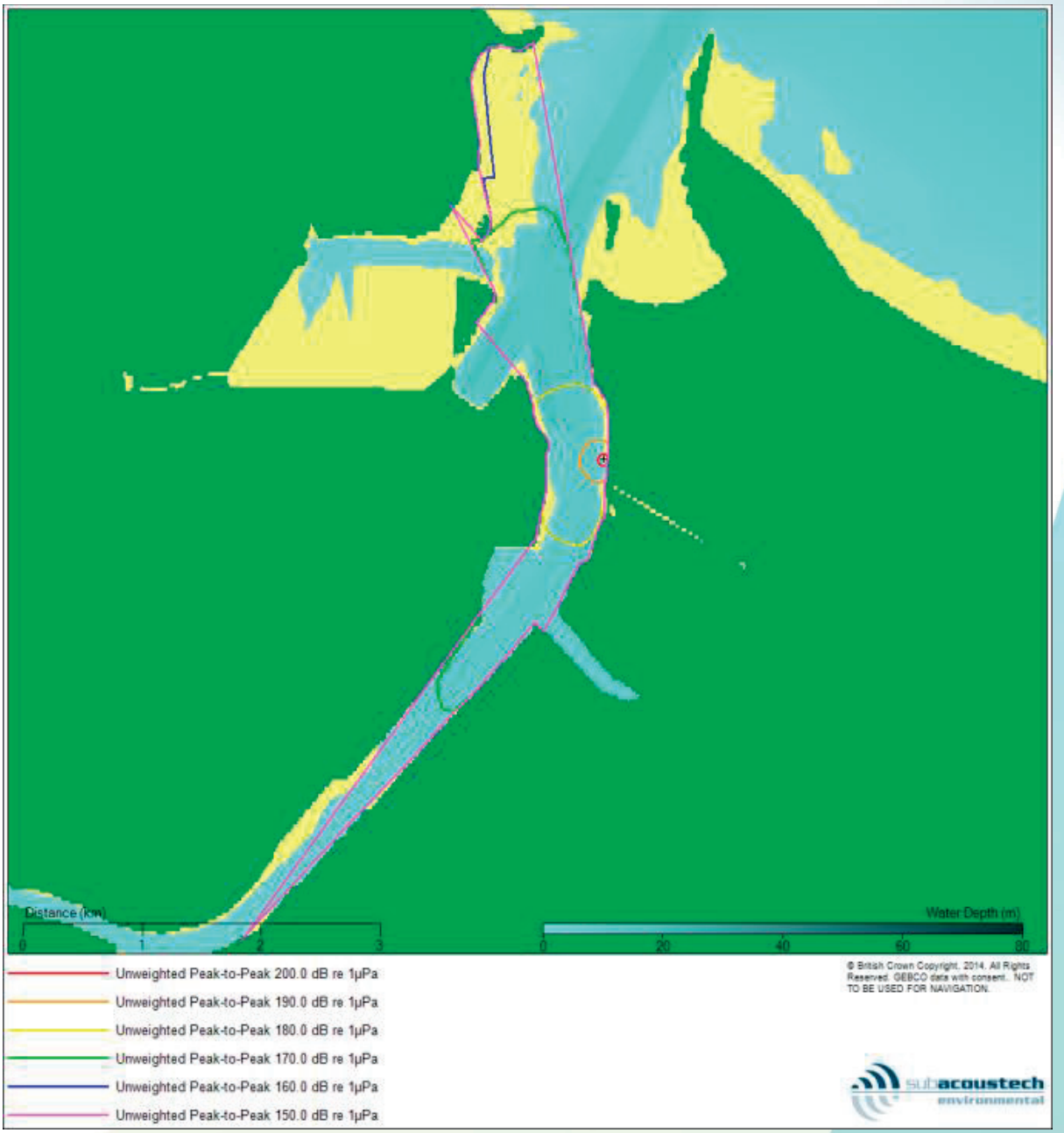


Figure 8-12 Contour plot showing the predicted unweighted peak-to-peak SPLs from impact piling of a 2000mm diameter pile at the North position

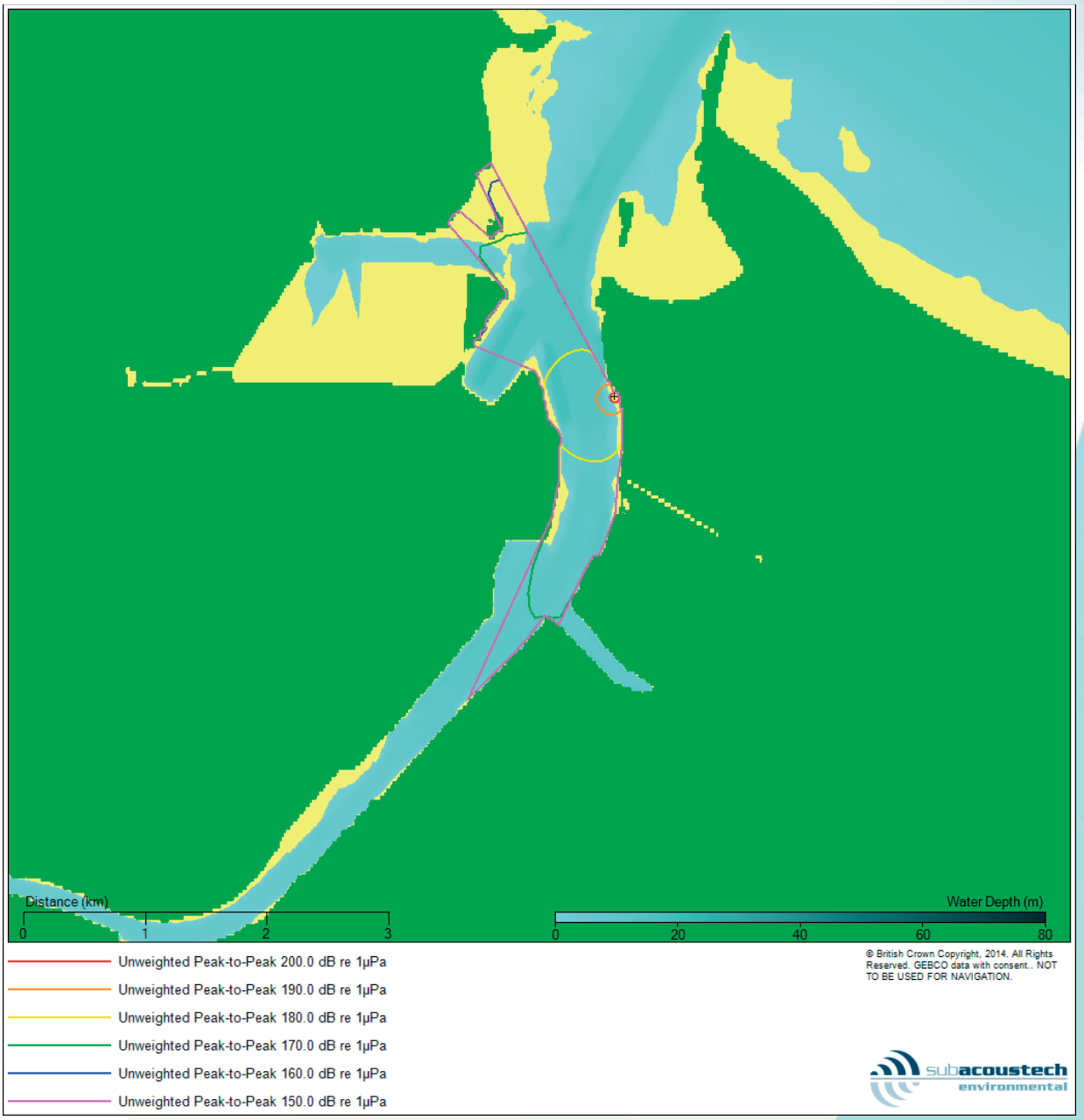
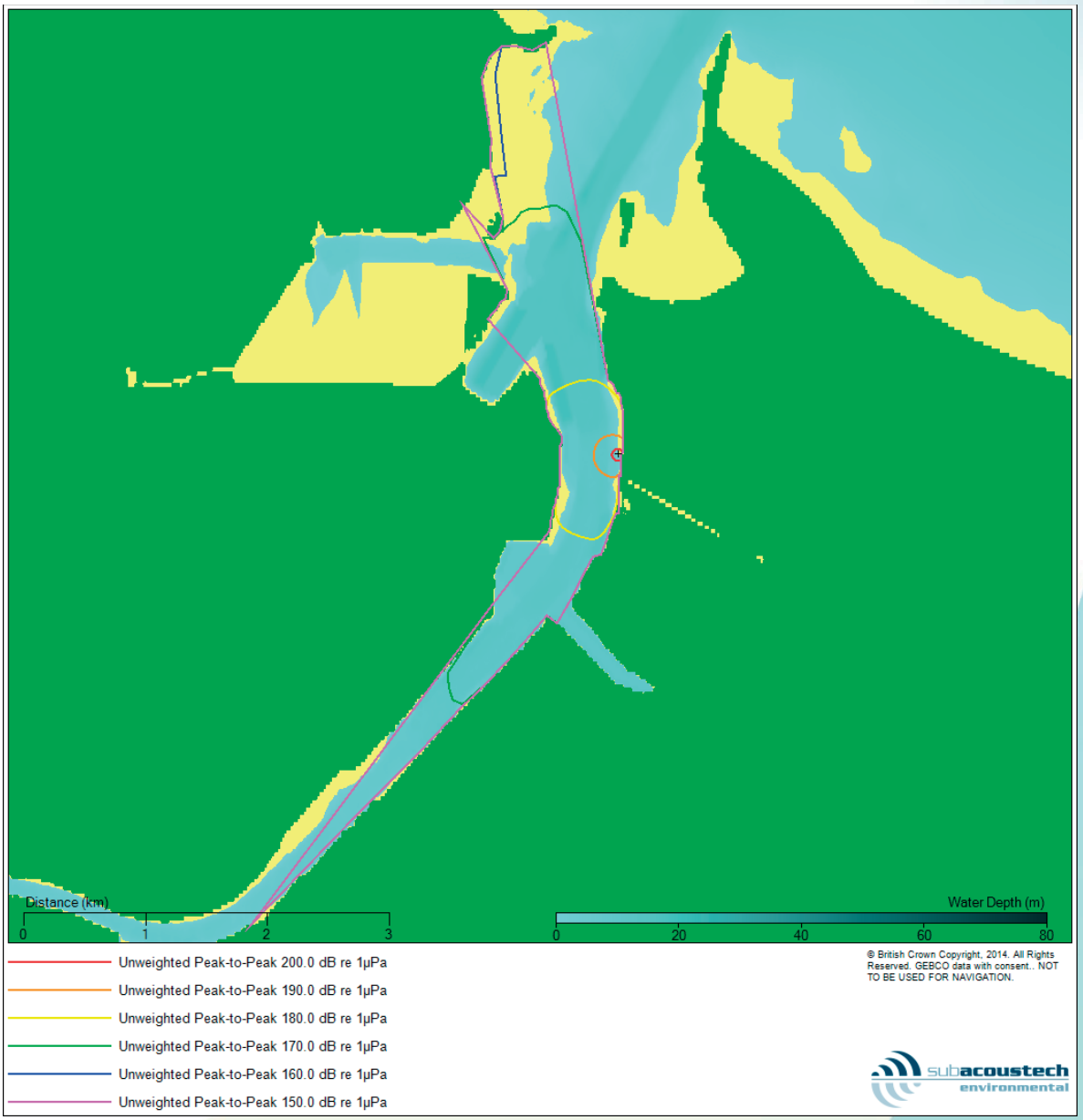


Figure 8-13 Contour plot showing the predicted unweighted peak-to-peak SPLs from impact piling of a 2000mm diameter pile at the South position



Modelling of dredging noise

8.4.57 The modelling results presented in **Table 8-13** provide a summary of the estimated ranges out to which certain unweighted RMS SPLs are expected to occur, from two different dredging operations (backhoe dredging and suction dredging). It can be seen in **Table 8-13** that the unweighted RMS levels for suction dredging extend to a greater range compared to the predicted ranges for a backhoe dredger. As with the modelling results for impact piling, the minimum range presented in **Table 8-13** reaches a limit. However, as only three transects have been modelled for dredging noise, the minimum limit is the river bank opposite the dredge footprint (a distance of 485m).

Table 8-13 Summary of the modelled ranges for unweighted RMS SPLs in 10dB increments for dredging activities

Unweighted RMS SPLs	Backhoe dredging			Suction dredging		
	Maximum range	Minimum range	Mean range	Maximum range	Minimum range	Mean range
160 dB re 1 µPa	<5m	<5m	<5m	20m	20m	20m
150 dB re 1 µPa	10m	10m	10m	95m	75m	88m
140 dB re 1 µPa	30m	25m	28m	475m	335m	423m
130 dB re 1 µPa	105m	65m	92m	2140m	485m*	1310m
120 dB re 1 µPa	480m	275m	400m	2460m	485m*	1700m
110 dB re 1 µPa	1860m	485m*	1090m	2920m	485m*	1860m

8.5 Assessment of potential impacts during construction

Direct removal of habitat due to quay construction and capital dredging

Direct impact to subtidal habitat

8.5.1 The dredging that would be required to create the berthing pocket and approaches would result in the direct loss of benthic community within the footprint of the dredge (combined total of approximately 16ha for Phase 1 and Phase 2). This does not constitute a long term habitat loss (as subtidal habitat would still be present below the dredged footprint) but, in the short term, the benthic community would be removed from within the capital dredged areas.

8.5.2 The infaunal benthic community in and immediately adjacent to the dredged approach channel was found to be similar throughout the surveyed area. Within the location of the proposed berthing pocket, polychaetes and oligochaetes characterise the benthic community, with the opportunistic *Capitella capitata* being one of the dominant species.

8.5.3 One of the reasons for the difference in observed biotopes between the approach channel and the footprint of the proposed berthing pocket is likely to be the maintenance dredging that occurs within the navigation channel which would have a periodic impact on the benthic community.

8.5.4 The sensitivity of the infaunal community within the subtidal zone is considered to be low. The magnitude of the effect is predicted to be medium but would not present an irreversible loss of habitat; the benthic community would be expected to recover to one that is similar to that present throughout the existing dredged approach channel. Hence it is concluded that the potential impact would be of **minor adverse** significance.

Direct impact to intertidal habitat

8.5.5 The proposed scheme would result in the direct loss of intertidal due to reclamation (for the solid quay structure) and revetment installation (for the open quay structure). The area of intertidal loss would differ depending on the preferred option selected for the quay construction. The maximum area of intertidal loss would be associated with the solid quay and is calculated as 3.6ha.The direct loss of

intertidal as a result of the proposed scheme would represent a long term, irreversible change. In light of the quality of intertidal habitat present, the receptor is considered to be of low value; but the magnitude of the effect would be high. It is estimated that of the maximum area that would be lost beneath the footprint of the port terminal (3.6ha), approximately 1.85ha would be mud, with the remainder consisting of hard substrata. All of the area that would be lost represents available 'habitat' for waterbirds and fish but, taken as a whole, it is of poor quality. Hence it is predicted that the impact associated with the loss would be of **minor adverse** significance. This assessment is precautionary because, should the open quay structure be taken forward, the revetment beneath the quay would itself provide a habitat which would not be dissimilar to the existing areas of revetment. However, the new revetment would not represent a notable estuarine habitat and its value in supporting fish and waterbirds is likely to be low.

Mitigation measures and residual impact

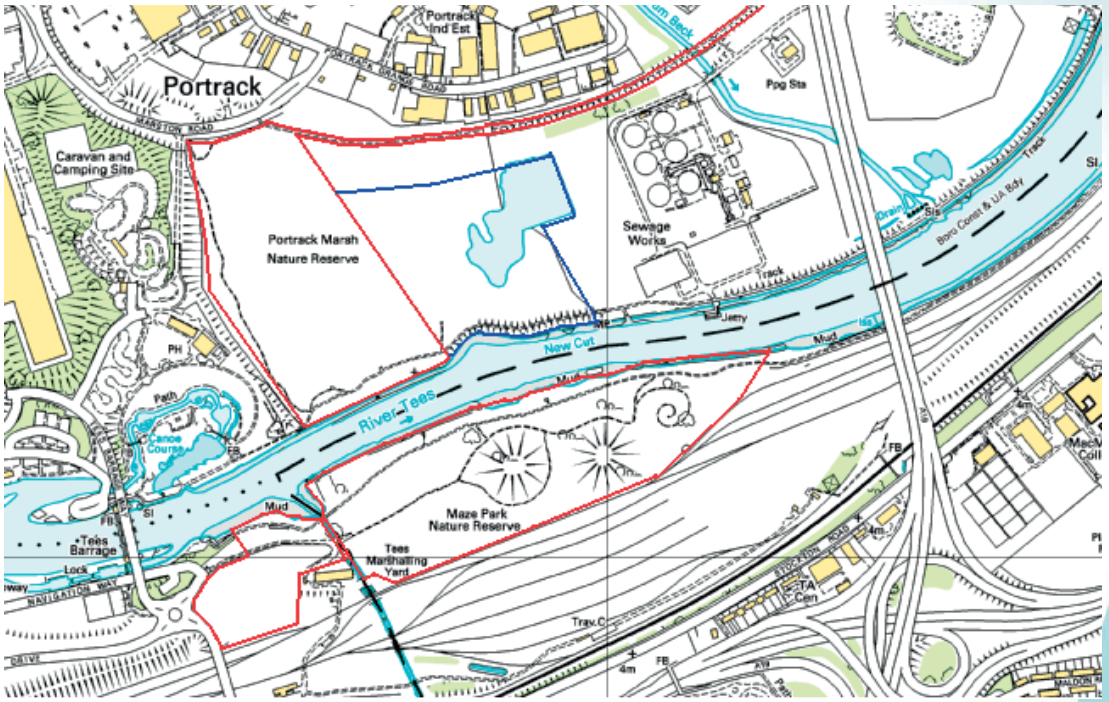
8.5.6 It is recognised that the port terminal and capital dredging would have an impact on biodiversity that is unavoidable, although this is not predicted to represent 'significant harm' as defined in the NPPF. To this end, the footprint of the proposed capital dredging and quay construction has been minimised as far as possible, within the constraint of delivering a port terminal that meets the operational requirements of the project. In addition, in light of the loss of intertidal habitat that would arise, and concern expressed about this impact by Natural England and the Environment Agency, YPL have progressed discussions with the Tees Valley Wildlife Trust regarding making a contribution to habitat creation proposals that the Wildlife Trust are considering (detailed below).

8.5.7 Tees Valley Wildlife Trust and Northumbrian Water Ltd share ownership of the Portrack Marsh Nature Reserve, which comprises 15ha of marshland adjacent to the River Tees on the first tidal reach below the Tees Barrage (Grid Ref: NZ 467 193; see **Figure 18-14**). The Trust also owns Maze Park Nature Reserve on the south bank of the river.

8.5.8 Portrack Marsh is situated on undisturbed land at the centre of Middlesbrough and Stockton. Despite its urban location, the reserve functions as part of a network of natural spaces along the Tees and supports an important assemblage of breeding and overwintering wetland birds. Typically, 90-100 bird species visit annually, with a total of 153 species recorded overall. These include wintering wildfowl, passage waders and breeding warblers. Otter was first recorded on the reserve in 2004 and there is evidence of its continued use of the site since. Smaller pools on the reserve support smooth newts and toads. Butterflies and dragonflies provide some additional interest.

8.5.9 The marsh contains a series of freshwater pools with fairly extensive areas of rank grassland dominated by sea aster. It is separated from the River Tees by a slag-armoured river bank and flood mound.

Figure 8-14 Plan showing Tees Valley Wildlife Trust land ownership (red) and Northumbrian Water Limited land dedicated for conservation under S.106 agreement (blue)



8.5.10 When the Wildlife Trust took on management of this land in 1998, it was of low and declining conservation interest. At this time the water quality in the Tees was considered to be too poor to investigate any form of integration of the site with the river, but a number of freshwater pools were excavated within the site and these proved to be valuable for birds, including assemblages of wetland bird species associated with the Teesmouth and Cleveland Coast SPA.

8.5.11 The Wildlife Trust now propose to re-profile and 'naturalise' up to 350m of river bank (and potentially a further 700m at Maze Park), which would increase the area of land subject to tidal influence and available to wading birds as feeding habitat. There is also an opportunity to create a network of channels and pools within Portrack Marsh, linked to the River Tees and subject to daily tidal inundation. Notably, the east coast tidal flooding event that occurred on 6 December 2013 resulted in a breach of the river bank at Portrack Marsh, giving a clear indication of the lowest point in the river bank, the effects of water on the landholding and the extent to which land might be flooded.

8.5.12 Assessment of the possible means of enabling daily inundation of some of the land within Portrack Marsh has been undertaken and it is considered that use of regulated tidal exchange through the embankment between the Tees and Portrack Marsh is likely to be the preferred mechanism. This would allow controlled inundation of land and would create habitat for eel and for feeding waders such as redshank. Softened and naturalised banks in the Tees would also provide feeding habitat for wading birds. It is estimated that these measures would improve and create up to 3ha of intertidal habitat on land that is currently of lower ecological value.

8.5.13 Monthly bird counts undertaken since 2002 provide a baseline from which the success of any conservation interventions could be measured.

8.5.14 YPL are pleased to contribute funding towards the implementation of habitat improvement measures at Portrack Marsh and in the Tees, as described above. Of the works proposed, it is estimated that approximately 2ha would be within Portrack Marsh and, therefore, would not represent river frontage habitat, but would make a biodiversity contribution to the estuary system; in that it would benefit feeding waterbirds and fish. The remaining works (estimated at up to 1ha) would be within the River Tees frontage and would create intertidal sediment feeding areas for waterbirds. .

8.5.15 Taken together, the habitat enhancement proposals for Bran Sands lagoon (which form part of the Harbour facilities proposals, as described in Section 3) and the proposed habitat improvement measures at Portrack Marsh and in the Tees (to which YPL would contribute) would deliver approximately 8.7ha of new or improved habitat, the majority of which would represent a significant benefit to the structure and function of the Teesmouth and Cleveland Coast SPA and Ramsar site. When considered in the context of the loss of up to 3.6ha of low quality habitat, and only 1.85ha of mud, this represents an overall gain in both the area and quality of habitat that would be available.

To summarise, the habitats enhancement and improvement measures would deliver the following outcomes in terms of biodiversity benefit:

- Improved feeding, roosting, loafing and nesting habitat for waterbirds would be provided in Bran Sands lagoon (see Section 9);
- A wider variety of habitat would be provided in Portrack Marsh nature reserve (i.e. intertidal habitat would complement existing habitats in the reserve), with benefits for feeding waterbirds and fish.
- River frontage habitat in the Tees estuary would be improved adjacent to the Portrack Marsh nature reserve and on the opposite bank at Maze Park by providing a more naturalised profile compared with the current banks, with benefits for feeding waterbirds, fish and potentially saltmarsh vegetation.
- For the open quay option for the port terminal, the revetment would represent a habitat for fish and, in this respect, would serve a similar function to the existing foreshore.

8.5.16 The measures proposed are predicted to provide a net biodiversity benefit, in that the measures would provide a significant resource for waterbird feeding, roosting, loafing and nesting (with a combined area of the proposed shallows and islands of approximately 5.7ha at Bran Sands and up to 3ha at Portrack Marsh and in the adjacent Tees estuary) as well as providing feeding habitat for fish. The re-profiling of the bank of the Tees estuary would provide a more natural habitat and create a gradation of estuary. As a whole, the measures would make a significant and positive contribution to the functioning of the estuarine system and provide a biodiversity gain..

Potential impacts to marine ecology from increased total suspended sediment during dredging and deposition following dredging

Sediment resuspension

8.5.17 During capital dredging, a proportion of the material that is dredged would be disturbed and re-suspended into the water column, dispersed and deposited onto the seabed. Hence, the construction phase would result in increases in the total suspended sediment (TSS) concentrations of the water column. The proposed dredging operations would not, however, result in any significant loss of contaminated sediments into the water column given the proposed use of an enclosed grab for

dredging the contaminated silt that overlies the geological material. This section, therefore, relates to the potential impact to marine ecology associated with the resuspension of uncontaminated sediment.

8.5.18 An increase in the TSS concentration in the water column would increase turbidity and reduce the depth of water that light can penetrate and, therefore, the amount of light available for primary production by phytoplankton and marine algae. At high levels and/or for prolonged periods of time, an increase in TSS concentrations can inhibit or prevent benthic organisms from feeding by clogging feeding apparatus (e.g. filter feeding molluscs). In addition, high concentrations of suspended sediment may impact upon fish through clogging of gill lamellae, potentially leading to death, whilst lower concentrations can result in sub-lethal stress or avoidance reactions. Further consideration of the potential impacts of increases TSS concentrations on fish is provided in **Section 11**.

8.5.19 In general, sediment plumes induced by dredging are considered to pose only a limited risk to water quality (and subsequently marine ecological species) since the affected water usually has the capacity to accommodate an increased oxygen demand, particularly where dredging takes place in open sea or estuaries (CIRIA, 2000). The tidal exchange within the Tees estuary would remain unrestricted during the construction and operational phases, and significant peaks in TSS would only occur on a short term basis during Phase 1 and Phase 2. During dredging, suspended sediment would rapidly disperse away from the location of the dredge due to the relatively high current speeds in the unconfined area (as illustrated in the sediment dispersion plots included in **Section 5.5**).

8.5.20 As discussed during **Section 3**, the proposed dredging of geological deposits may involve the use of a TSHD, CSD and a backhoe dredger. The assessment of potential impacts on marine ecological receptors from increased concentrations of suspended sediment and sediment deposition following dredging has been based on a worst case scenario, involving the use of a TSHD and CSD. As discussed in **Section 5.5**, a backhoe dredger is considered likely to minimise the resuspension of sediment into the water column as far as possible (assuming best operational practice is implemented during dredging). A backhoe dredger is similar to a land-based excavator, and dredges the material in consolidated lumps as opposed to creating a more fluid slurry of dredged material. The potential for increased concentrations of suspended sediment within the water column due to dredging using a backhoe dredger, therefore, would be significantly reduced in comparison with the potential for such effects due to the use of a TSHD or CSD.

8.5.21 The sediment plume dispersion plots presented in **Section 5.5** illustrate that the footprint of effect on suspended sediment is greatest for a TSHD during low river flow and spring tide conditions. On average, predicted mean concentration increases outside of the dredging area are a few tens of mg/l at most (extending approximately 1km upstream and downstream of the dredge footprint). The simulations also indicate a significant difference in excess concentrations from one side of the navigation channel to the other, with the most dispersion along the main direction of flow on the eastern side of the channel.

8.5.22 Estuarine benthic communities typically have a degree of tolerance to conditions of high and variable TSS, as concentrations can vary significantly in response to tidal conditions and other events such as storms (increased wave action) and high rainfall.

Sediment deposition

8.5.23 As discussed above, a proportion of the sediment that is dredged would be disturbed, re-suspended into the water column, dispersed and deposited back onto the seabed.

8.5.24 The results of the sediment plume modelling undertaken specifically for the proposed scheme are discussed within **Section 5.5**. For the TSHD, deposition rates of up to 10mm per day are predicted in an area approximately 2km and 3km either side of the proposed dredge footprint (upstream and downstream respectively). Deposition of 10mm to 20mm is predicted at the location of the TSHD.

8.5.25 For the CSD, deposition rates of up to 10mm are predicted in an area approximately 1.5km either side of the dredge footprint. Immediately upstream and downstream of the CSD and barge, deposition of tens of centimetres is predicted. The sediment predicted to be deposited within the immediate area of the dredger would be re-dredged.

8.5.26 No average increase in suspended sediment concentration is shown over the intertidal for any of the potential dredging methods, leading to a prediction of negligible sediment being able to deposit on the intertidal areas. Based on the sediment plume modelling results, no significant indirect impacts on intertidal habitats due to sediment deposition following dredging are anticipated. Subtidal deposition is predicted to be mostly within the existing dredged navigation channel.

8.5.27 Overall, it is considered that the sensitivity of the receptor is low and the magnitude of the effect would be low. It is concluded that the potential impact would be of **negligible** significance.

Mitigation measures and residual impact

8.5.28 The controls outlined within **Section 7.5** with regard to minimising suspended sediment load during dredging are also of relevance to this impact. The residual impact is predicted to be of **negligible** significance.

Noise and vibration disturbance to marine mammals

8.5.29 The generation of underwater noise during the construction works is inevitable due to piling for the construction of the port terminal (for either construction option) and capital dredging. There is little published information on the levels of underwater noise produced by piling and dredging activities and its environmental implications.

8.5.30 Seals are the marine mammal species most likely to be impacted by underwater noise in the Tees estuary. Harbour (common) seal (*Phoca vitulina*) is the most sensitive seal species to underwater sound (based on current peer reviewed audiogram data, including Mohl 1968 and Schusterman, 1998). Harbour seal was therefore considered a species of concern within regard to impacts from underwater noise.

8.5.31 Harbour seals are highly mobile and would tend to avoid such disturbance and relocate to unaffected areas close by. The ConocoPhillips Teesside LNG Plant ES (RSK, 2007) describes noise modelling undertaken to estimate the behavioural response range for seals from piling operations. Ranges of 500m for seals were reported for a response to be observed in the target species. Further discussion

of the potential impacts of noise on fish and commercial fisheries resources can be found in **Section 11**.

8.5.32 The Tees estuary is an industrialised environment experiencing high levels of shipping and construction activity along its shores and is subject to the existing maintenance dredging regime. The underwater noise survey has shown that the Tees estuary has many sources of anthropogenic noise, with shipping being the main source.

8.5.33 An interpretation of the underwater noise modelling results (Subacoustech, 2014) has been undertaken to inform the impact assessment, in accordance with the assessment criteria presented in **Section 8.4**. The results of the interpretation are presented below.

Unweighted metrics

8.5.34 The source level for the noise from impact piling operations using a hammer with maximum blow energy of 125kJ has been estimated at 223.5 dB re 1 µPa at 1m (SPL_{peak}). This value exceeds the 220 dB re 1 µPa (SPL_{peak}) criteria (Parvin *et al*, 2007) for physical injury, however, does not exceed the 240 dB re 1 µPa (SPL_{peak}) criteria for lethal effect. The maximum range to which the 220 dB re 1 µPa (SPL_{peak}) criteria extends for a 914mm diameter pile and a 2000mm diameter pile is limited, at 4m and 8m respectively. The underwater noise source levels from dredging operations was estimated at 165 dB re 1 µPa at 1m (SPL_{RMS}) and 183 dB re 1 µPa at 1m (SPL_{RMS}) for a backhoe and suction dredger respectively. These source levels are below the levels which are anticipated to result in physical injury or behavioural response in marine mammals.

The dB_{ht} (species) metric – auditory injury

8.5.35 The 130 dB_{ht} (species) perceived level is used to indicate traumatic hearing damage over a very short exposure time. **Table 8-14** shows the ranges to which traumatic hearing damage may occur for harbour seals as a result of impact piling using a 914mm diameter pile and a 2000mm diameter pile. Harbour seal are predicted to have a large range for 130 dB_{ht} (species), at 32m and 34m from the modelled North and South positions respectively (914mm diameter) and 56m and 62m from the modelled North and South position respectively (2000mm diameter).

Table 8-14 Summary of the modelled ranges for 130 dB_{ht} (species) levels for impact piling operations using a 914mm and 2000mm diameter pile

130 dB_{ht} (species)		Impact piling (914mm diameter)		Impact piling (2000mm diameter)	
		North position	South position	North position	South position
Harbour seal	Maximum	32m	34m	56m	62m
	Minimum	24m	20m	24m	20m
	Mean	29m	30m	47m	50m

The dB_{ht} (species) metric – behavioural response (impact piling)

8.5.36 The data in **Table 8-16** and **Table 8-17** present a comparison of the estimated 90 and 75 dB_{ht} (species) impact ranges for behavioural response for harbour seals, associated with impact piling a 914mm diameter pile and a 2000mm diameter pile respectively. As with the unweighted noise level data presented in **Table 8-11**, the minimum range from impact piling reaches a limit (24m at the North position and 20m at the South position). It can be seen that the estimated impact ranges from impact piling are predicted to be up to 4.89km from the South position (where 75 dB_{ht} (species) impact ranges extend to the river banks for all modelled transects).

8.5.37 **Figure 8-15** presents the ranges in **Table 8-15** in the form of a contour map; **Figure 8-16** presents the ranges in **Table 8-16**. It should be noted that the 130 dB_{ht} (species) contours are too small to be visible at the scale of the data in **Tables 8-15** and **8-16**.

8.5.38 It is important to acknowledge in this context that piling activities would not present a constant noise source and those periods between pile driving (e.g. when repositioning the piling barge, or when boring/pre-augering of holes) would provide opportunity for unimpeded movement of seals both up and downstream within the main river channel.

Table 8-15 Summary of the modelled ranges for 90 and 75 dB_{ht} (species) levels for impact piling of a 914mm diameter pile

Impact piling		North position		South position	
		90 dB_{ht} (species)	75 dB_{ht} (species)	90 dB_{ht} (species)	75 dB_{ht} (species)
Harbour seal	Maximum	2.50km	2.75km**	3.01km	4.89k**
	Minimum	24m*	24m*	20m*	20m*
	Mean	503m	511m	584m	634m

Table 8-16 Summary of the modelled ranges for 90 and 75 dB_{ht} (species) levels for impact piling of a 2000mm diameter pile

Impact piling		North position		South position	
		90 dB_{ht} (species)	75 dB_{ht} (species)	90 dB_{ht} (species)	75 dB_{ht} (species)
	Maximum	2.75km**	2.75km**	4.47km	4.89km**
	Minimum	24m*	24m*	20m*	20m*
	Mean	510m	510m	620m	630m

The dB_{ht} (species) metric – behavioural response (backhoe and suction dredging)

8.5.39 The data in **Table 8-17** present a comparison of the 90 dB_{ht} and 75 dB_{ht} (species) impact ranges for behavioural response in harbour seal, predicted to arise due to backhoe and suction dredging.

8.5.40 The data show that the modelled impact ranges from dredging operations are all predicted to be 10m or less.

Table 8-17 Summary of the modelled ranges for 90 and 75 dB_{ht} (species) levels for backhoe and suction dredging levels with regard to harbour seal

Species		Backhoe dredging		Suction dredging	
		90 dB_{ht} (species)	75 dB_{ht} (species)	90 dB_{ht} (species)	75 dB_{ht} (species)
Seal	Maximum	<5m	<5m	<5m	10m
	Minimum	<5m	<5m	<5m	10m
	Mean	<5m	<5m	<5m	10m

M-Weighted SELs

8.5.41 The accumulated exposure to sound leading to the potential onset of auditory injury for marine mammals has been assessed using the criteria proposed by Southall *et al* (2007), using M-Weighted SELs. The multiple pulse results have been created by assuming a receptor flees from the noise source at a speed of 1.5m/s. It has also been assumed that one pile would take 90 minutes to drive, with six piles being installed in a 12 hour period.

8.5.42 **Table 8-18** shows the ranges to which 186 dB re 1 μPa^2s for pinnipeds (in water) are likely to extend, for single pulse exposure and for exposure over multiple pulses, based on the assumptions outlined above (with regard to impact piling a 914mm diameter pile). The maximum range for single pulses is predicted to be 6m at both the North and South positions. The maximum range for an exposure to multiple pulses, assuming the animal is fleeing, is 310m at the South position and 130m at the North position. **Table 8-19** shows the ranges for impact piling of a 2000mm diameter pile. The maximum range for single pulse of a 2000mm diameter pile is predicted to be 14m and 16m from the North and South position respectively. The maximum range for an exposure to multiple pulses, assuming the animal is fleeing, is 880m at the South position and 460m at the North position.

Figure 8-15 Contour plot showing the predicted 90 and 75 dB_{ht} levels for harbour seal for impact piling using a 914mm diameter pile and blow energy of 125 kJ

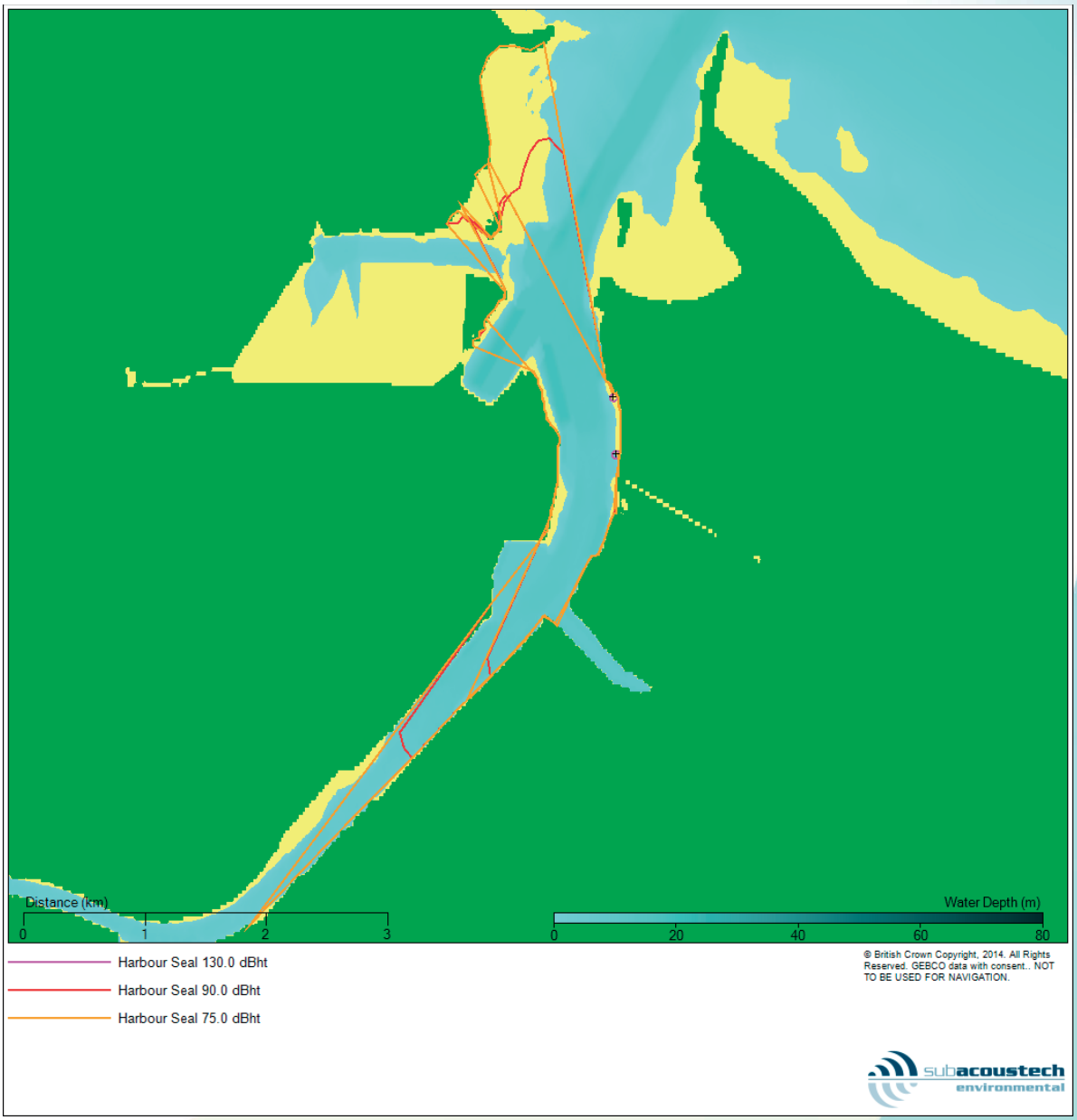


Figure 8-16 Contour plot showing the predicted 90 and 75 dB_{ht} levels for harbour seal for impact piling using a 2000mm diameter pile and blow energy of 125 kJ

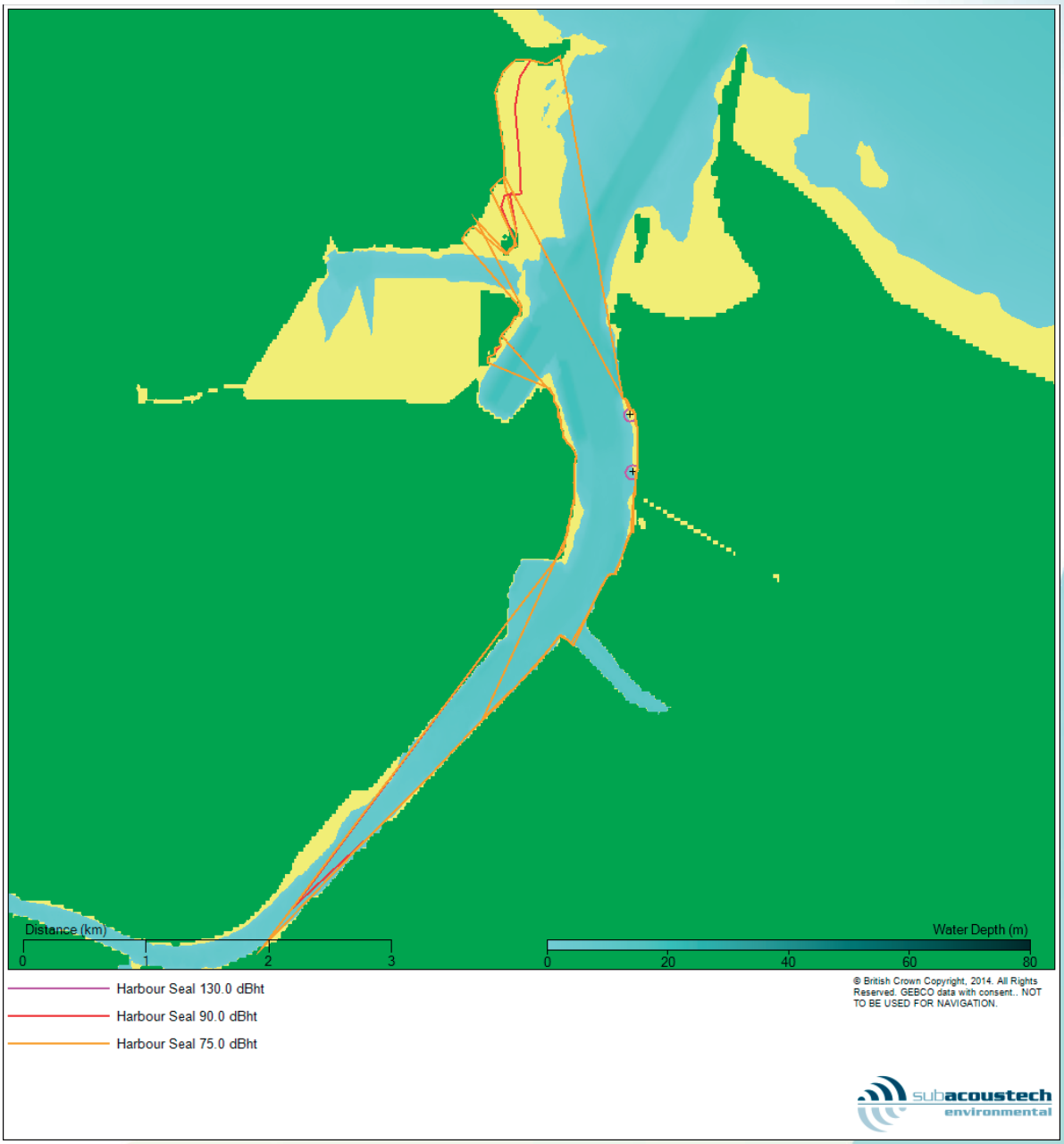


Table 8-18 Summary of impact ranges from impact piling a 914mm diameter pile using Southall *et al* 2007 criteria SEL of 186 dB re 1 μPa^2s for pinnipeds (in water)

Pinnipeds (in water) 186 dB re 1 μPa^2s	North position		South position	
	Single pulse	Multiple pulse	Single pulse	Multiple pulse
Maximum range	6m	130m	6m	310m
Minimum range	4m	100m	4m	100m
Mean range	5m	105m	5m	134m

Table 8-19 Summary of impact ranges from impact piling a 2000mm diameter pile using Southall *et al* 2007 criteria SEL of 186 dB re 1 µPa^{2}s for pinnipeds (in water)

Pinnipeds (in water) 186 dB re 1 µPa^{2}s	North position		South position	
	Single pulse	Multiple pulse	Single pulse	Multiple pulse
Maximum range	14m	460m	16m	880m
Minimum range	12m	100m	12m	100m
Mean range	13m	190m	15m	260m

Summary of underwater noise assessment

8.5.43 Modelling of underwater noise from piling operations shows that, using unweighted SPL_{peak} noise criteria, noise levels are not predicted to be high enough for marine mammals to suffer a lethal effect. Physical traumatic injury could occur, but only out to 4m and 8m, for all marine species from impact piling a 914mm and 2000mm diameter pile respectively. Modelling of underwater noise from the proposed dredging operations shows that noise levels are not predicted to be sufficient to reach the unweighted criteria for lethal effect, physical injury or behavioural response.

8.5.44 The largest estimated ranges out to which traumatic hearing damage may occur from impact piling of a 914mm diameter pile and 2000mm diameter pile using the 130 dB_{ht} (species) criteria is predicted to be 34m and 62m respectively for harbour seal. The modelled dB_{ht} (species) sound propagation for backhoe and suction dredging is not predicted to reach the level at which traumatic hearing damage could occur.

8.5.45 The impact range for behavioural response is indicated using the 90 and 75 dB_{ht} perceived level criteria. Modelling for behavioural response shows that the impact range from impact piling for harbour seal is 3.01km, for 90 dB_{ht} (914mm diameter pile) and 4.47km (2000mm diameter pile). For 75 dB_{ht}, the maximum range reached 4.89km for harbour seal for both the 914mm and 2000mm diameter pile (the distance to the bankside from the noise source). The 90 and 75 dB_{ht} impact ranges for backhoe and suction dredging are predicted to be 10m or less.

8.5.46 Using the M-Weighted SEL for assessing auditory injury in marine mammals from impact piling, the ranges have been calculated for the 186 dB criteria in pinnipeds for both the 914mm and 2000mm diameter pile. For the 914mm diameter pile, the single pulse SEL impact range was predicted to be a maximum of 6m, whereas the maximum impact range for the multiple phase SEL was calculated at 310m. For the 2000mm diameter pile, the single pulse SEL impact range was predicted to be a maximum of 16m, whereas the maximum impact range for the multiple phase SEL was predicted at 880m.

8.5.47 Harbour seals (and grey seals) are considered to be receptors with very high sensitivity, as both species are listed as vulnerable under the EC Habitats Directive.

8.5.48 However, piling activities would not present a constant noise source and there would be periods between pile driving (e.g. when repositioning the piling barge or boring/pre-augering holes) which would allow for unimpeded movement of seals both up and downstream within the main river channel. In addition, the noise disturbance to seals due to piling and dredging would be reversible once such

operations are completed. In addition, the modelling results have predicted that the source noise levels would not result in a lethal effect on marine mammals.

8.5.49 Based on the information presented above, the magnitude of the effect on marine mammals as a result of noise and vibration is considered to be medium. The sensitivity of the receptor is considered to be high. Without mitigation, an impact of **moderate adverse** significance is, therefore, predicted to arise with respect to marine mammals as a result of underwater noise and vibration.

Mitigation measures and residual impact

8.5.50 It is considered likely that the following measures would be required to reduce the potential for adverse impacts to marine mammals.

8.5.51 The JNCC's guidelines 'Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise' (JNCC, 2010) should be adhered to during pile driving. This would include checking for marine mammals during a pre-piling search prior to piling operations commencing, the establishment of a mitigation zone (i.e. an area within which a marine mammal could be exposed to sound levels which could cause damage) and the use of soft start techniques to allow any marine mammals time to leave the area of greatest disturbance.

8.5.52 In order to further reduce the potential for adverse impacts to marine mammals due to noise and vibration, a minimum of eight hours continuous break in every 24 hour period would be implemented where no impact piling is carried out.

8.5.53 With the implementation of the above mitigation measures, a residual impact of **minor adverse** significance is predicted.

Potential effects of accidental spillages of oils, fuels and chemicals from vessels

8.5.54 There is the potential for accidental releases of substances into the marine environment which could result in a pollution incident and consequently impact upon the health of marine species. The implications of a pollution incident on water quality and, therefore, other environmental parameters such as marine ecology are highly dependent on both the nature of the substance released and the scale of the incident.

8.5.55 As it is difficult to quantify the likely amount (and nature) of any spillages or leakages into the marine environment, it is not possible to predict the significance of the potential impact. However, the risk of a pollution incident occurring and its impact on marine ecological receptors can be controlled through the implementation of the mitigation measures outlined below.

Mitigation measures

8.5.56 A spill kit (including booms for potential leaks directly into the marine environment) should be kept on site at all times during the construction phase and any major spills or leakages controlled and reported to the Environment Agency and Harbour Master.

8.5.57 PD Teesport (the harbour authority) is a spill responder for the Tees estuary. Hence there will be plans in place to ensure spillages or leakages can be rapidly and effectively managed.

8.5.58 With the above mitigation measures in place, it is anticipated that the risk of a significant pollution event occurring is **low**. In addition, the consequences of a pollution incident would be minimised as far as possible.

8.6 Assessment of potential impacts during operation

Noise and vibration disturbance to marine ecological receptors

8.6.1 The generation of noise from shipping movements during the operational phase is an unavoidable consequence of the proposed scheme. However, the Tees estuary is an industrialised environment with high levels of shipping and construction activity along its shores. The Tees estuary is also subject to the existing maintenance dredging regime which will generate underwater noise. As discussed above, existing shipping activity was found to be the main source of underwater noise within the Tees estuary during an underwater noise survey carried out in April 2014. Consequently, it can be concluded that there are at present a number of sources of anthropogenic noise in the Tees estuary.

8.6.2 Based on the greatest number of anticipated vessel movements of 191 per year (during Phase 2 of the proposed scheme) and a monthly average of 878 vessel movements (in 2013) in the Tees, the overall monthly increase in vessel movements in the estuary would be 1.8%. Therefore, the increase in average noise levels during the operational phase from increased vessel movements would be minimal; the magnitude of the effect would be very low. An impact of **negligible** significance is therefore anticipated.

Mitigation measures and residual impact

8.6.3 No mitigation measures are required and the residual impact would be of **negligible** significance.

Potential effects of accidental spillages of oils, fuels and chemicals from vessels

8.6.4 There is the potential for accidental releases of substances into the marine environment during operation which could result in a pollution incident and consequently impact upon the health of marine species. As discussed in **Section 7.6**, in addition to the risk of spills and leaks of oils and fuels from vessels, there is also the risk of accidental release of product into the marine environment during ship loading. As described for the construction phase, the implications of a pollution incident on water quality and, therefore, other environmental parameters such as marine ecology are highly dependent on both the nature of the substance released and the scale of the incident.

8.6.5 As stated in **Section 7.6**, the polyhalite product would be transported from the MHF to the port terminal via a conveyor system, in a pellet form with a wax coating. There is only one area of the Harbour facilities where an accidental release of polyhalite into the marine environment could occur (i.e. during ship loading). In the event of a spill, the wax coated pellets are likely to be dispersed rapidly by a combination of the currents and tides; the components of polyhalite product form no significant threat to the marine environment.

8.6.6 As it is difficult to quantify the likely amount (and nature) of any spillages or leakages into the marine environment, it is not possible to predict the significance of the potential impact; the impact is therefore considered in terms of risk of a spill or pollution event occurring. Based on the above, a **low risk** of such an incident occurring is predicted.

Mitigation measures

8.6.7 A spill kit (including booms for potential leaks directly into the marine environment) should be kept on site at all times during the construction phase and any major spills or leakages controlled and reported to the Environment Agency and Harbour Master.

8.6.8 PD Teesport (a spill responder) will have plans in place to ensure spillages or leakages can be rapidly and effectively managed. The residual impact of accidental spills and leaks occurring is assessed in terms of risk, which is considered to be **low** in this case. .

Recovery of the benthic community following completion of capital dredging

8.6.9 There would be a requirement for regular maintenance dredging of the approaches to the proposed port terminal and the berthing pocket. During the operational phase, there would be a requirement to maintain an area that is not currently routinely maintained (i.e. the proposed berthing pocket), in addition to areas which are currently maintained.

8.6.10 Maintenance dredging represents a repeated disturbance to the benthic community within the dredged area and limits recovery of the benthic community following the impact that would occur as a result of capital dredging. Although there would be recovery following capital dredging, the community would be likely to be characterised by a community similar to that observed within other maintained reaches of the navigation channel.

8.6.11 Any recolonisation of the seabed following the capital dredging would be beneficial compared with the immediate post-dredge situation but, given that maintenance dredging would restrict continuous recovery, the benthic community that colonises the seabed following capital dredging would be expected to be different to that currently present within the areas of seabed located outside of the existing navigation channel. The proposed scheme, therefore, would result in a reduction in the range of biotopes present within the locality of the works, with the removal of the SS.SMU.ISaMu.Cap (*Capitella capitata* in enriched sublittoral muddy sediments) and SS.SMU.SMuVS.CapTubi (*Capitella capitata* and Tubificoides spp. in reduced salinity infralittoral muddy sediment) from the shallower subtidal area that would be impacted by capital dredging. The loss of the benthic community is assessed as a construction phase impact. The recovery in the operational phase is predicted to have an effect of low magnitude and the receptor is of low value; hence the impact is predicted to be of **negligible** significance.

Mitigation measures and residual impact

8.6.12 Maintenance dredging of the approach channel and berth pocket (and the associated regulator disturbance to the benthic community) is an unavoidable consequence of the proposed scheme. The residual impact would be of **negligible** significance.

8.7 Assessment of potential impacts during decommissioning

8.7.1 The proposed port terminal is a long term infrastructure project; there is no intention to decommission the terminal. Therefore there would be no marine works required, and **no impacts** on marine ecology as a result of the decommissioning phase.

8.8 Summary

8.8.1 The Tees estuary comprises intertidal sand and mudflats, rocky shore, saltmarsh and sand dunes. Activities such as land claim, construction of breakwaters and training walls have all significantly modified the estuary over the last 150 years.

8.8.2 The study area contains a number of sites which have been designated for their nature conservation value. Seal Sands is an important haul-out site for both common (harbour) seals and grey seals. Monitoring undertaken by INCA identified that the 2012 season saw the birth of 18 seal pups, which continues the upwards trend in pup births evident in recent years.

8.8.3 The intertidal within the footprint of the port terminal is considered to be of low quality and the surface consists of a mixture of bricks, rubble, road planings and gabions with areas of mud and standing water. The subtidal zone is dominated by the SS.SMU.ISaMu (Infralittoral sandy mud) biotope, with shallower areas in the vicinity of the proposed berthing pocket comprising the SS.SMU.ISaMu.Cap (*Capitella capitata* in enriched sublittoral muddy sediments) and SS.SMU.SMuVS.CapTubi (*Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment) biotopes. The macrobenthic communities sampled are typical of the Tees estuary, with annelids dominating in terms of the number of taxa, abundances and biomass.

8.8.4 A number of potential impacts have been identified which could arise during the construction and operational phases of the proposed scheme, including direct removal of subtidal habitat and intertidal due to capital dredging and quay construction, indirect impacts on marine ecology due to potential reductions in water quality, noise disturbance to seals and smothering of benthic habitat due to the deposition of sediment. A summary of the potential impacts anticipated to arise during the construction and operation phase of the proposed scheme with regard to marine ecology is presented in **Table 8-20**.

Table 8-20 Summary of impacts anticipated to arise during the construction and operation phase of the proposed scheme with regard to marine ecology

Impact	Sensitivity of receptor	Magnitude of effect	Significance of impact	Mitigation	Residual impact
Construction					
Direct removal of habitat due to quay construction and capital dredging	Low (subtidal); Very low (intertidal)	Medium (subtidal); High (intertidal)	Minor adverse (subtidal); Minor adverse (intertidal)	The potential impacts are unavoidable consequences of the proposed scheme and cannot be mitigated. However, habitat enhancement measures are included within the proposed scheme and it is predicted that this would deliver a net biodiversity gain. In addition, YPL have progressed discussions with the Tees Valley Wildlife Trust regarding making a contribution to habitat creation proposals that the Wildlife Trust are considering.	Minor adverse (subtidal); Minor adverse (intertidal)
Potential impacts to marine ecology from increased total suspended during dredging and deposition following dredging	Low	Low	Negligible	Controls would be implemented during dredging as outlined below. Limiting re-suspension during TSHD can be achieved by optimising the trailing velocity, position of the suction mouth and discharge of the pump with respect to each other, and directing the flow lines of the suction stream to the actual point of excavation. Reduction of sediment plumes during backhoe dredging can be achieved by using an experienced operator and limiting the swing of the backhoe over water. Re-suspension of sediment during CSD can be reduced through optimising the cutter speed, swing velocity and suction discharge, shielding the cutter head and optimising the design of the cutter head.	Negligible
Noise and vibration disturbance to marine	High	Medium	Moderate adverse	JNCC's guidelines 'Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise' should be adhered to during pile driving. This would include	Minor adverse

Impact	Sensitivity of receptor	Magnitude of effect	Significance of impact	Mitigation	Residual impact
mammals				checking for marine mammals during a pre-piling search prior to piling operations commencing, the establishment of a mitigation zone and the use of soft start techniques. In order to further reduce the potential for adverse impacts to marine mammals due to noise and vibration, a minimum of eight hours continuous break in every 24 hour period would be implemented where no impact piling is carried out.	
Accidental spillages of oils, fuels and chemicals from vessels	Not possible to assess	Not possible to assess	Low risk	A spill kit (including booms for potential leaks directly into the marine environment) should be kept on site at all times. Any major spills or leakages controlled and reported to the Environment Agency and Harbour Master.	Low risk
Operation					
Noise and vibration disturbance to marine ecological receptors	High	Very low	Negligible	No mitigation measures are required.	Negligible
Accidental spillages of oils, fuels and chemicals from vessels	Not possible to assess	Not possible to assess	Low risk	A spill kit (including booms for potential leaks directly into the marine environment) should be kept on site at all times. Any major spills or leakages controlled and reported to the Environment Agency and Harbour Master.	Low risk
Recovery of benthic community following capital dredging	Low	Low	Negligible	No mitigation measures are possible.	Negligible