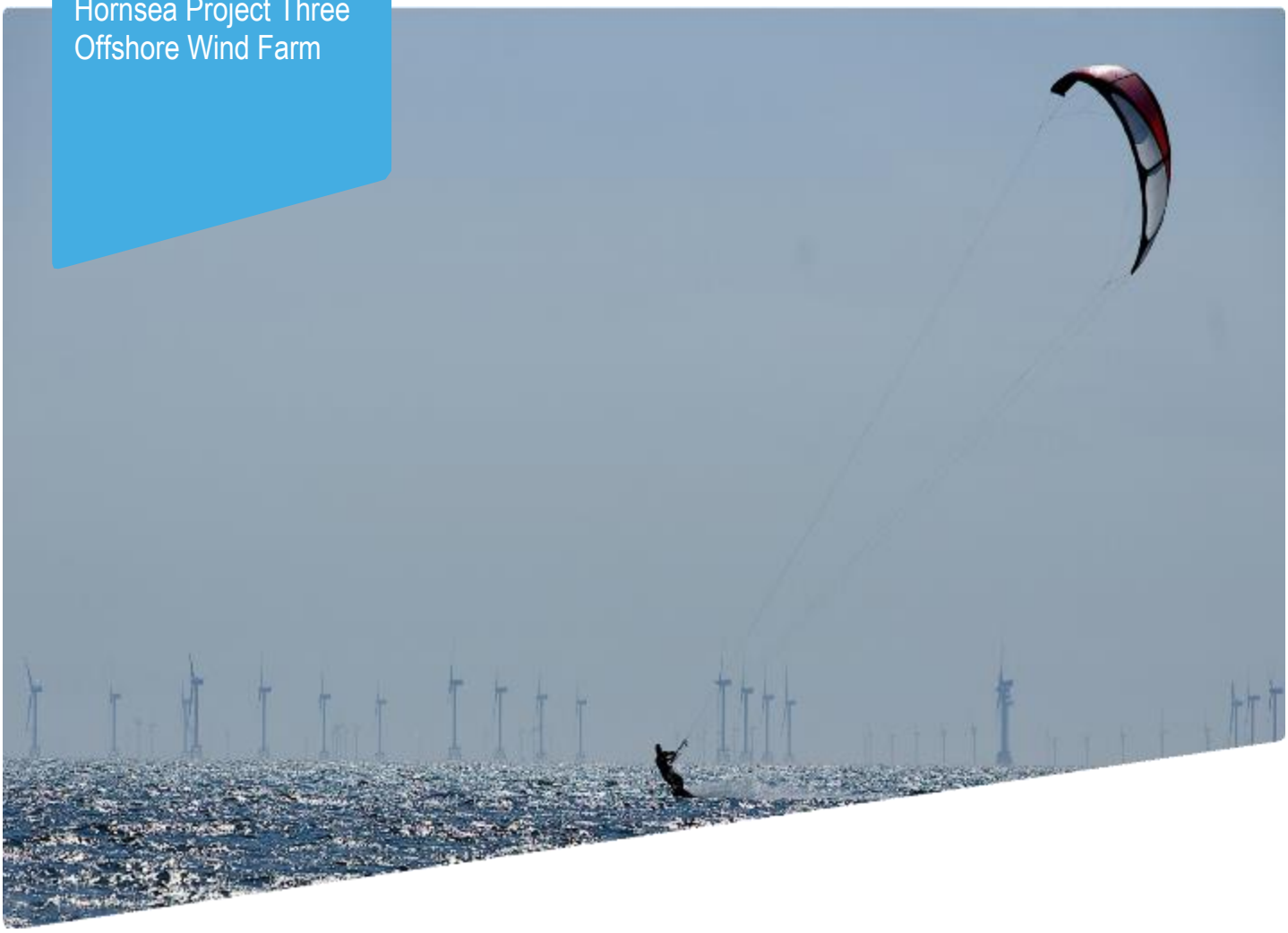
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Appendix 5 to Deadline I submission - The Wash and North Norfolk Coast SAC - Baseline and impacts of cable installation Clarification Note

Date: 7th November 2018

Hornsea 3
Offshore Wind Farm

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1. Introduction

1.1 This note has been produced to provide clarification on the assessment of the impacts of export cables within the Hornsea Three offshore cable corridor within The Wash and North Norfolk Coast SAC, as presented in Volume 2, Chapter 2: (Document A6.2.2) and the Report to Inform Appropriate Assessment (RIAA; Document A5.2).

1.2 The Relevant Representations from Natural England and the Marine Management Organisation (MMO) raised questions in relation to the site specific data within the nearshore re-route of the Hornsea Three offshore cable corridor. The Relevant Representation comments are set out in the following sections of the Relevant Representations:

- Natural England Relevant Representation: Section 4.2, 5.3.5, 5.4.6, 5.4.7,
- MMO Relevant Representation: General comment 1 and Comments 4.2 and 4.13.

1.3 Natural England also commented on the recovery of the seabed following cable installation, highlighting that some cable installation methodologies have resulted in trenches being formed which take longer to infill than anticipated (e.g., cable plough and mass flow excavator; Natural England Relevant Representation Section 5.3.2).

1.4 Based on the Relevant Representation points outlined above, the scope of this clarification note includes details of:

- A baseline validation survey undertaken within the section of the Hornsea Three offshore cable corridor which coincides with The Wash and North Norfolk Coast SAC (Section 2); and
- Clarification on the potential for recovery of the seabed following cable installation in the nearshore area based on data collected over installed cables in the nearshore area and recent monitoring of Hornsea Three geotechnical investigations in the vicinity of the Hornsea Three offshore cable corridor landfall (Section 3).

2. Baseline Validation Survey within The Wash and North Norfolk Coast SAC

Background

2.1 As outlined in paragraph 2.6.1.4 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, subsequent to the completion of Environmental Impact Assessment (EIA) baseline surveys for Hornsea Three and publication of the Preliminary Environmental Information Report (PEIR) in July 2017, re-routes were made to the Hornsea Three offshore cable corridor described in the PEIR. These re-routes were made as a result of the EIA consultation process, through the Benthic Ecology, Fish and Shellfish and Marine Processes Expert Working Group (EWG), and specifically in response to comments by Natural England, the Joint Nature Conservation Committee (JNCC) and the Wildlife Trusts on the potential effects of cable installation and operation and maintenance on the Cromer Shoal Chalk Beds MCZ and the North Norfolk Sandbanks and Saturn Reef SAC. The Hornsea Three offshore cable corridor in the nearshore area was re-routed such that it now extends through approximately 11 km of The Wash and North Norfolk Coast Special Area of Conservation (SAC) rather than the 7 km assumed for the PEIR. It was discussed with the Benthic Ecology, Fish and Shellfish and Marine Processes EWG that a combination of Hornsea Three site-specific data and desktop data sources in this area would provide a robust characterisation of the nearshore area, including the Hornsea Three offshore cable corridor re-route section.

2.2 During the EWG meetings Natural England questioned the coverage of site-specific data within the part of the Hornsea Three offshore cable corridor that coincides with The Wash and North Norfolk Coast SAC. Whilst the approach to characterisation of this area was discussed with the Benthic Ecology, Fish and Shellfish Ecology and Marine Processes EWG, as discussed in paragraph 2.1, Natural England have maintained that the mixed sediments present in this area may qualify as Annex I habitat (i.e. Annex I stony reef), since The Wash and North Norfolk Coast SAC is designated for stony reef.

2.3 Since the Hornsea Three application for development consent was submitted in May 2018, the Applicant has undertaken a drop down video (DDV) survey of the Hornsea Three offshore cable corridor that coincides with The Wash and North Norfolk Coast SAC in the nearshore area. The purpose of this survey has been to validate the benthic ecology baseline, and therefore for the predictions made, within Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

Summary of the Baseline and Assessments Presented in Volume 2, Chapter 2: Benthic Ecology of the Environment Statement

Benthic ecology baseline summary

2.4 As outlined in paragraph 2.6.1.4 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, a combination of Hornsea Three site specific data and desktop data sources were used to characterise the nearshore area, including the Hornsea Three offshore cable corridor re-route section. A description of the nearshore benthic ecology study area of Hornsea Three, is presented in paragraphs 2.7.1.11 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and paragraphs 4.1.4.83 *et seq*. of Volume 5, Annex 2.1 - Benthic Ecology Technical Report of the Environmental Statement (Document A6.5.2.1).

2.5 The following section gives a brief overview of the conclusions made within Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement with respect to i) the habitats predicted to be present within the part of the offshore cable corridor that coincide with The Wash and North Norfolk Coast SAC and ii) the known distribution of Annex I stony reef in The Wash and North Norfolk Coast SAC.

Predicted habitats within The Wash and North Norfolk Coast SAC

2.6 The desktop data sets which were used to extend the nearshore biotope maps generated from the Hornsea Three site specific benthic ecology data into The Wash and North Norfolk Coast SAC are outlined in paragraph 2.7.6.2 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement. The desktop data indicated that the sediment types were broadly similar across the area with sandy sediments inshore grading into coarse/mixed sediments further offshore within The Wash and North Norfolk Coast SAC. The consistency of this pattern across datasets and over a long time series, provided confidence in the extrapolation of biotopes into areas where there had been no site-specific sampling and confidence in the sufficiency of this information for the purposes of the Environmental Impact Assessment

2.7 Paragraphs 4.1.4.83 *et seq.* of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement describe the biotopes present within The Wash and North Norfolk Coast SAC. The biotopes predicted are also shown in Figure 2.5 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement. The most inshore part of Hornsea Three offshore cable corridor was predicted to be characterised by the SS.SSa.IFiSa.NcirBat (NcirBat) sandy sediment biotope with relatively impoverished communities. The site-specific DDV survey of the most inshore section of the Hornsea Three offshore cable corridor, in October 2017, confirmed that the inshore area was primarily characterised by sandy sediments, with rippled sand recorded (see paragraph 4.1.4.87 of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement).

2.8 With increasing distance offshore, the sediments were predicted to be characterised by coarse and mixed sediment. The associated biotopes were predicted to be predominantly the SS.SBR.PoR.SspiMx (SspiMx) biotope with a small area of the SS.SCS.ICS.MoeVen (MoeVen) biotope (Figure 2.1). These patterns were broadly consistent with findings of previous surveys in this area for the Sheringham Shoal and Dudgeon offshore wind farms, as well as surveys within The Wash and North Norfolk Coast SAC.

Annex I reef habitat within The Wash and North Norfolk Coast SAC

2.9 Paragraphs 3.1.3.8 *et seq.* of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement describes where Annex I reef habitats have been recorded throughout The Wash and North Norfolk Coast SAC. The majority of these habitats have been primarily recorded within The Wash, with Annex I stony reef being recorded in the north and along the western flanks of The Wash. Subtidal mussel beds have also been recorded in areas of The Wash, off Seal Sand in the south east of the embayment and *Sabellaria spinulosa* reefs have been detected throughout much of the subtidal in The Wash area with the most consistent records of *S. spinulosa* reefs in the edges of the Well, Roaring Middle, Lynn Deeps and Lynn Knock, all outside of the Hornsea Three offshore cable corridor.

2.10 As discussed in paragraphs 4.1.4.88 *et seq.* of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement, areas of potential chalk outcrops within the innermost part of the Hornsea Three offshore cable corridor, within The Wash and North Norfolk Coast SAC, were surveyed in October 2017. The DDV survey confirmed an increased proportion of mixed course sediments, including gravel, cobbles and occasional boulders in these areas but no Annex I reef habitat within the areas surveyed.

2.11 For the purposes of the assessment presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, a precautionary approach was adopted which assumed that all the subtidal sediment within The Wash and North Norfolk Coast SAC was part of the Annex I Sandbanks feature of the SAC. Table 2.11 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement summarises the benthic subtidal features, included in the assessment, for which The Wash and North Norfolk Coast SAC is designated (i.e. Sandbanks which are slightly covered by sea water all the time and Reefs). The conclusion presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement was that Annex I reef habitats were unlikely to be present within the part of the Hornsea Three offshore cable corridor which coincides with The Wash and North Norfolk Coast SAC.

Benthic ecology assessment summary

2.12 The assessments of impacts to Annex I habitats (i.e. Sandbanks which are slightly covered by seawater all the time and Reefs) within The Wash and North Norfolk Coast SAC from cable installation during construction and from the presence of cable protection are presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement as follows:

- Temporary impacts to Annex I habitats within The Wash and North Norfolk Coast SAC from cable installation are presented in paragraph 2.11.1.69 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement; and
- Impacts to Annex I habitats within The Wash and North Norfolk Coast SAC from long term habitat loss associated with cable protection is presented in paragraphs 2.11.2.22 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

2.13 Paragraphs 2.11.1.73 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement describes that the impact of temporary loss/disturbance within The Wash and North Norfolk Coast SAC is predicted to be localised to discrete sections of the Hornsea Three offshore cable corridor, intermittent in nature and reversible. The sensitivity of the component biotopes of the Annex I Sandbanks which are slightly covered by seawater all the time (the biotopes being representative of the sub-features of the Annex I habitat) habitat is discussed in paragraphs 2.11.1.74 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and was considered to be low to medium. As concluded in paragraph 2.11.1.80 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, the effects on Annex I Sandbanks which are slightly covered by seawater all the time were predicted to be of minor significance. Any potential effects on Annex I reef habitats would be minimised through identification of such features during a pre-construction survey of the Hornsea Three offshore cable corridor. Where such Annex I habitats are identified within the offshore cable corridor, appropriate measures will be employed to avoid direct impacts on these, where possible (Table 2.18 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement).

2.14 Paragraphs 2.11.2.22 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement outline that the predicted long-term habitat loss of up to 0.004% of the total area of The Wash and North Norfolk Coast SAC will be localised to discrete sections of the Hornsea Three offshore cable corridor, affecting a small proportion of the seabed within the eastern periphery of The Wash and North Norfolk Coast SAC. The designed-in mitigation measures to employ sensitive cable protection within the areas of designated sites that coincide with Hornsea Three which will consider the local seabed conditions, as outlined in Table 2.18 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, was predicted to allow some recovery of communities in areas where cable protection is placed and reducing the extent of long term habitat loss in The Wash and North Norfolk Coast SAC (Note: a clarification note on this point will to be provided to Natural England and MMO in early October 2018). As concluded in paragraph 2.11.2.28 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, effects of long-term habitat loss on Annex I Sandbanks which are slightly covered by seawater all the time were predicted to be of minor significance.

Hornsea Three 2018 Benthic DDV Survey Methodology

2.15 As discussed in paragraph 2.3, Hornsea Three undertook a DDV survey of the part of the Hornsea Three offshore cable corridor that coincides with The Wash and North Norfolk Coast SAC in July 2018.

DDV survey methodology

2.16 The benthic DDV survey was conducted on the 13 July 2018 by Ocean Ecology using standard DDV survey methodologies which were consistent with baseline characterisation surveys along the Hornsea Three offshore cable corridor. The survey collected video footage and stills at five sample locations within The Wash and North Norfolk Coast SAC. Given the relatively short section of the Hornsea Three offshore cable corridor within the SAC, where site specific sampling was not collected pre-application, five sampling locations (each approximately 1 km apart), was considered to be an appropriate level of survey effort when considered in the context of the lower sampling intensity along the Hornsea Three offshore cable corridor. At each DDV sampling location a cruciform transect was used to collect data on the habitats present (Figure 2.1). The survey recorded a total of 95 minutes of video footage and 175 still photographic images from 175 camera 'drops' over the five sample locations.

2.17 Before each deployment a 'clapperboard' displaying the site name, sample number and date was videoed and photographed as a quality assurance record. During deployment, the camera sent a continuous feed to the surface via a soft umbilical, where the 'drop' was monitored and controlled by a suitably qualified camera operator. Each time a 'drop' was made, a still photograph was taken to capture a representative image of the dominant seabed habitat and sediment types along each video transect. Attached to the camera was a reference laser scale, calibrated to 10 cm, to aid in later analysis. Throughout the camera deployment navigation data was recorded, and all camera deployment logs were synchronised to the navigation data from the Global Positioning System (GPS).

Data analysis and Annex I habitats assessment methodology

2.18 A suitably qualified marine ecologist from RPS reviewed the raw data (i.e. video footage and stills) from the DDV survey in order to describe the sediments and communities present within the part of the Hornsea Three offshore cable corridor coinciding with The Wash and North Norfolk Coast SAC surveyed. An Annex I habitats assessment for each of the five sample locations was also undertaken in accordance with the methodology described below.

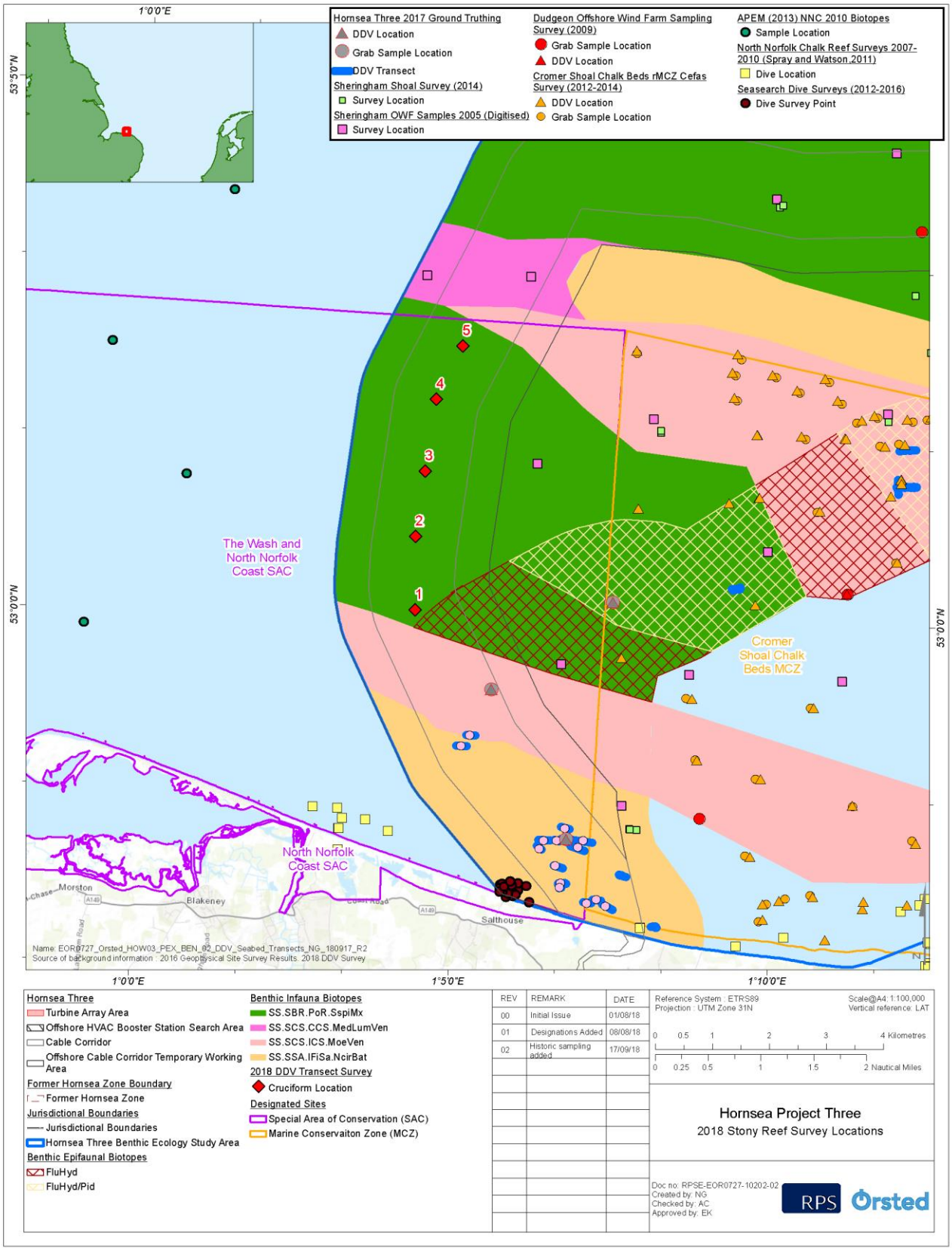


Figure 2.1: Hornsea Three 2018 DDV sampling locations, with Hornsea Three 2017 grab and DDV sampling locations and desktop data sources used to inform baseline characterisation.

Annex I Stony reef assessment methodology

2.19 For each of the five DDV locations, an Annex I stony reef assessment was undertaken in accordance with the relevant guidance (i.e. Irving, 2009; Jenkins *et al*., 2015) to determine if a potential stony reef was present. The assessment comprised of a measure of elevation and patchiness, and extent where possible, as outlined in Table 2.1. The same methodology was applied as was used for the stony reef assessment presented in Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement. The scoring system proposed by Irving (2009) and the 'reefiness' matrix described in Jenkins *et al*. (2015), was used to draw together all the information to interpret the 'reefiness' of stony features (Table 2.2). The conclusion of the Irving (2009) guidance was that a reef should be elevated above flat sea floor, have an area of at least 25 m^2 and have a composition of no less than 10% coverage of the seabed (Irving, 2009).

2.20 The analysis of the photographs and video footage was carried out using software that allowed slow-motion, freeze frame and standard play analysis. Still images were assessed with reference to the corresponding video footage, thus allowing each still image to be assessed with knowledge of the wider habitat in which it fell.

2.21 Detailed video analysis consisted of a description of the seabed and the identification of flora and fauna to the lowest practical taxonomic level. The positions of any boundaries of different sediment classifications were determined and related back to the navigation data. General descriptions of the fauna were made, and special attention was given to the presence of any potential geogenic or biogenic reef features. The abundance data of recorded fauna were recorded using the SACFOR abundance scale, devised by the JNCC (Connor and Hiscock, 1996) and uses the average species size to classify the population.

Table 2.1: Summary of the analysis and scoring of stony reef characteristics (based on Irving, 2009).

Characteristic	Analysis of characteristics
Elevation	A rough estimate of the height of the reef from the video footage or photographic stills, and placement within the following size categories of flat seabed, <64 mm, <64 mm to 5 m and >5 m high. This was averaged for the total surveyed area, or discrete feature, where possible.
Composition	Estimated from the video footage as a continuous video if conditions allow, or as a series of camera drops or photographic stills along a transect. Where the latter technique was employed, patchiness determined on a site by site basis from the following calculation: $\frac{\text{Total percentage of stony cover over the whole site}}{\text{Total area surveyed}} \times 100$
Extent	An area of 25 m^2 or greater is considered the minimum extent a reef should cover.

Table 2.2: Stony reef assessment matrix (based on Irving, 2009 and Jenkins *et al*., 2015; see Table 2.3 of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement.

'Reefiness' matrix			Elevation			
			Flat seabed	**<64 mm**	**64 mm-5 m**	**>5 m**
			Not a reef	**Low**	**Medium**	**High**
Composition (% cover)	10%	Not a reef	NOT A REEF	NOT A REEF	NOT A REEF	NOT A REEF
	10 to 40% matrix supported	Low	NOT A REEF	LOW	LOW	LOW
	40 to 95%	Medium	NOT A REEF	LOW	MEDIUM	MEDIUM
	>95% clast supported	High	NOT A REEF	LOW	MEDIUM	HIGH

Other Annex I habitats

2.22 Following the analysis of the DDV survey data no other potential Annex I reef habitats (e.g. *S. spinulosa* reefs) were identified from the video footage or stills and, as such, no other methodologies have been included.

Hornsea Three 2018 Benthic DDV Survey Results

Sediment and broad habitat type

2.23 Analysis of the DDV stills and video footage showed that the locations sampled during the 2018 survey were characterised by coarse to mixed sediments comprising predominantly sandy gravels and gravelly sands with varying proportions of muddy sediments.

2.24 The epifaunal communities recorded are discussed in the following sections on the stony reef assessment, but were typically characterised by hydroids, bryozoans including *Flustra foliacea* and *Alcyonidium diaphanum* and anemones *Actiniaria* spp. colonising the coarse sediment and shell fragments. Mobile species were also present including crustaceans such as *Brachyura* spp. and *Caridea* spp. and star fish including *Crossaster papposus* and *Asterias rubens*.

2.25 On the basis of the sediment type and epifaunal species observed in the DDV footage and stills only (i.e. in the absence of infaunal data), the benthic epifaunal communities present at Sites 1 to 4 are considered to be representative of the SS.SMx.CMx.FluHyd *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment biotope. As noted in the JNCC description of the biotope, in the absence of an infaunal sample to fully characterise it, it is possibly best considered an epibiotic overlay. As discussed in the following section (see paragraph 2.31), no epifaunal species were recorded in the DDV footage and stills at Site 5, as such no epifaunal overlay biotope has been assigned to this location.

Annex I stony reef assessment

2.26 Table 2.3 presents a summary of the Annex I stony reef assessment undertaken for the five survey locations shown in Figure 2.1. In summary, no Annex I reef habitats were recorded within the area surveyed during the Hornsea Three 2018 DDV survey of the part of The Wash and North Norfolk Coast SAC that coincides with the Hornsea Three offshore cable corridor. The following sections provide a more detailed description of the assessment undertaken for each of the five DDV locations. The stony reef assessment shows the change in sediment description, the elevation of substrate from the seabed, composition of cobbles (%), biota present, representative images of the DDV stony reef survey (Table 2.3), reef definitions and the 'reefiness' of the site in accordance to guidance set out by Irving (2009).

2.27 Sediments at Site 1, the most southernly location sampled during the 2018 survey within the Hornsea Three offshore cable corridor (Figure 2.1), were a mix of sands and gravels, with shell fragments and varying proportions of finer sediments (e.g. fine sand and mud). The sediments at Site 1 were considered as broadly comprising muddy sandy gravel (msG) and overall as mixed sediments according to the simplified Folk sediment classification (from Long, 2006). The epifaunal community recorded included hydroids, bryozoans *A. diaphanum* and *F. foliacea*, sea anemones *Actiniaria* spp. and mobile species including top shell *Trochoidea* spp. crustaceans *Brachyura* spp., *Inachidae* spp. and *Caridea* spp. and starfish *C. papposus* and *A. rubens*. Although pebbles and cobbles were recorded at this site, the elevation of the seabed was less than 64 mm. As outlined in Table 2.3, Site 1 was scored as 'not a reef' in all the relevant characteristic assessments (i.e. elevation and composition) and, therefore according to the guidelines set out by Irving, 2009 and the criteria in Table 2.2, the seabed at Site 1 was not considered to constitute an Annex I stony reef.

2.28 The sediments recorded at Site 2 (see Figure 2.1) were also predominately characterised by a mix of sands and gravels with shell fragments and occasional cobbles; the composition of cobbles was estimated at approximately 6.8%. Finer sediments were present and the sediments were considered as broadly comprising msG or mixed sediments according to the simplified Folk sediment classification. The epifaunal community recorded was characterised by hydroids, bryozoans *A. diaphanum* and *F. foliacea*, anemones *Actiniaria* spp. and *Sagartiidae* spp. and mobile species including crustaceans *Brachyura* spp. and *Caridea* spp., starfish *C. papposus* and one recorded fish species, pogge *Agonus cataphractus*. Whilst there were cobbles present at this site, they were not present in high enough quantities (i.e. >10%; see Table 2.2) or with sufficient elevation (i.e. > 64 mm; see Table 2.2) to constitute Annex I reef. As outlined in Table 2.3, Site 2 was scored as 'not a reef' in all the relevant characteristic assessments (i.e. elevation and composition) and, therefore, according to the guidelines set out by Irving, 2009 and Jenkins *et al*. (2015) and the criteria in Table 2.2, the seabed at Site 2 was not considered to constitute an Annex I stony reef.

2.29 A review of the photographic stills and video footage for Site 3 indicated a homogenous area of gravelly muddy sand sediment with shell fragments and few cobbles (approximately 2.6%). The site was classified as mixed sediment according to the simplified Folk sediment classification. The sediments at Site 3 had a higher sand content and reduced gravel content, compared to Sites 1 and 2, and as such also had reduced epifaunal communities (i.e. fewer species recorded and in lower abundances) associated with the sediment. The epifaunal communities present were characterised by hydroids and bryozoans *A. diaphanum* and *F. foliacea* and anemones *Actiniaria* spp. all typically recorded as Rare according to the SACFOR scale. Due to the low composition of cobbles at this site, and in line with the guidance described in paragraph 2.19 and Table 2.2, Site 3 was scored as 'not a reef' in all the relevant characteristic assessments (Table 2.3) and, therefore, does not constitute Annex I stony reef.

2.30 The sediments at Site 4 comprised predominantly gravelly muddy sands (gmS) with ripples and a few shell fragments. According to the simplified Folk classification, Site 4 was broadly classified as mixed sediment. The epifaunal community recorded in the DDV stills and video footage comprised hydroids and the bryozoans *A. diaphanum* and *F. foliacea*, as well as anemones *Actiniaria* spp. and crustaceans *Inachidae* spp. No reef features were identified, as a result Site 4 does not constitute as an Annex I stony reef. As outlined in Table 2.3, Site 4 was scored as 'not a reef' in all the relevant characteristic assessments (i.e. elevation and composition) and, therefore, according to the guidelines set out by Irving, 2009 and Jenkins *et al*. (2015) and the criteria in Table 2.2, the seabed at Site 4 was not considered to constitute an Annex I stony reef.

2.31 Site 5, the most northerly location sampled in the Hornsea Three 2018 DDV survey (see Figure 2.1), was characterised by coarse sediments, predominantly gravelly sand gS with ripples. Following a review of the photographs and video records, no infauna or epifauna was recorded at this site. As outlined in Table 2.3, Site 5 was scored as 'not a reef' in all the relevant characteristic assessments (i.e. elevation and composition) and, therefore, according to the guidelines set out by Irving, 2009 and Jenkins *et al*. (2015) and the criteria in Table 2.2, the seabed at Site 5 was not considered to constitute an Annex I stony reef.

Table 2.3: Hornsea Three 2018 DDV survey Annex I stony reef assessment.

Site	Sediment Description	Elevation (mm)	Composition (%)	Biota present	Representative photo	Reef definitions		Reefiness
						Elevation	Composition	
1	msG (mixed sediment) Muddy sandy gravel with shell fragments	<64mm	0%	*A. diaphanum, F. foliacea, Actiniaria* spp., *Trochoidea* spp., *Brachyura* spp., *Inachidae* spp., *Caridea* spp., *C. papposus, A. rubens* and hydroids.		Not a reef	Not a reef	**Not a reef**
2	msG (mixed sediment) Muddy sandy gravel with shell fragments and occasional cobbles	<64mm	6.80%	*A. diaphanum, F. foliacea, Actiniaria* spp., *Sagartiidae* spp., *Brachyura* spp., *Caridea* spp., *C. papposus, A. cataphractus* and hydroids.		Not a reef	Not a reef	**Not a reef**
3	gmS (mixed sediment) Gravelly muddy sand with shell fragments and few cobbles	<64mm	2.60%	*Actiniaria* spp., *F. foliacea, Actiniaria* spp, *A. rubens* and hydroids.		Not a reef	Not a reef	**Not a reef**

Site	Sediment Description	Elevation (mm)	Composition (%)	Biota present	Representative photo	Reef definitions		Reefiness
						Elevation	Composition	
4	(g)mS (Mixed sediment) Slightly gravelly muddy sand with ripples and few shell fragments	<64mm	2.40%	*A. diaphanum, F. foliacea, Actiniaria* spp., *Inachidae* spp. and hydroids.		Not a reef	Not a reef	**Not a reef**
5	(g)S (coarse sediment) Slightly gravelly sand with ripples	<64mm	0%	No infauna or epifauna visible.		Not a reef	Not a reef	**Not a reef**

Conclusion

2.32 This Clarification Note has been drafted in response to Natural England's comments regarding the sufficiency of the data used to inform the benthic ecology characterisation of the near-shore area of the Hornsea Three offshore cable corridor in the area that coincides with The Wash and North Norfolk Coast SAC, as presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

2.33 Analysis of the Hornsea Three 2018 DDV survey data has validated the predictions made within Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, as discussed in paragraph 2.10, that there is no evidence of Annex I stony reef habitat, or any other Annex I reef habitat, within the parts of the Hornsea Three offshore cable corridor which coincide with The Wash and North Norfolk Coast SAC. Any residual impacts to Annex I reefs which may develop prior to construction will be controlled via the designed-in mitigation measures discussed in Table 2.18 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement (i.e. that a pre-construction survey will be undertaken along the Hornsea Three offshore cable corridor to determine the location, extent and composition of any Annex I reefs within SACs and, should such reef features be identified appropriate measures will be discussed with statutory consultees to avoid direct impacts to these features, where possible, and on the basis of the extent of these features at the time of construction). On the basis that no Annex I reef habitat has been recorded within the areas surveyed, these mitigation measures, remain appropriate and valid for the habitats that have been recorded within the Hornsea Three offshore cable corridor.

2.34 As noted in paragraph 2.8 of the benthic characterisation presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement predicted that parts of the Hornsea Three offshore cable corridor that coincides with The Wash and North Norfolk Coast SAC were characterised by mixed sediments and the SspiMx biotope as the predominant biotope. As discussed in paragraph 2.23, the most recent Hornsea Three DDV survey has validated the prediction of predominantly mixed sediments in this area. However, as discussed in paragraph 2.25, the benthic epifaunal communities observed in the most recent Hornsea Three DDV survey suggest that the SspiMx biotope prediction in association with these mixed sediments was over precautionary and that the epifaunal communities in this area could more likely be classified as a FluHyd epifaunal overlay. Noting that infaunal samples would be required to confirm the infaunal biotope, no evidence of *S. spinulosa* was found during the 2018 DDV survey Hornsea Three DDV survey, therefore indicating that the allocation of the SspiMx biotope to this area of mixed sediment, for the purposes of the assessment presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement was over-conservative.

2.35 As outlined in paragraph 2.11.1.34 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement the sensitivity of the FluHyd biotope to temporary habitat loss/disturbance was assessed as low and the sensitivity of the SspiMx biotope was assessed as medium. Therefore, Hornsea Three is confident that assessment presented in paragraphs 2.11.1.69 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement with regards to effects of cable installation on benthic communities within The Wash and North Norfolk is precautionary and that the effects likely on the mixed sediment communities will be within the range of effects predicted in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

3. Recovery of Seabed in Nearshore

Background

3.1 During the Hornsea Three pre-application phase and the Evidence Plan process, Natural England have raised questions about the recovery potential of nearshore subtidal sediments and the associated benthic communities, and particularly those within the Cromer Shoal Chalk Beds Marine Conservation Zone (MCZ) and The Wash North Norfolk Coast Special Area of Conservation (SAC), following construction activities (e.g. cable installation and jack-up barge footprints associated with horizontal directional drilling (HDD) exit pits). As outlined in Section 1, Natural England have also raised in their Relevant Representation that, in their experience, cable burial techniques such as ploughing have resulted in trenches which have taken longer than anticipated to infill. They have outlined that the probability of this occurring should be considered further as well as the recoverability of both the sediment levels and associated communities.

Summary of assessment in Environmental Statement

3.2 A full assessment of the impact of temporary habitat loss, as a result of construction activities across Hornsea Three, is presented in paragraphs 2.11.1.3 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

3.3 Assessments of temporary habitat loss effects from export cable trenching and jack-up operations associated with HDD exit pits, on nearshore subtidal habitats within designated sites (and their corresponding biotopes) are presented in the Environmental Statement as follows:

- For the Cromer Shoal Chalk Beds MCZ the assessment of temporary habitat loss is presented in paragraphs 2.11.1.83 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and paragraphs 5.1.2.1 *et seq*. of Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement (Document A6.5.2.3); and
- For The Wash and North Norfolk Coast SAC the assessment of temporary habitat loss is presented in paragraphs 2.11.1.69 *et seq*. of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

3.4 The following sections give a brief overview of the conclusions made within the Environmental Statement with respect to i) the physical recovery of the sediments associated with areas affected by trenching and jack-up footprints and ii) the recovery of the benthic communities associated with potentially affected sediments.

Physical recovery of seabed topography

3.5 Paragraph 2.11.1.17 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and paragraphs 5.1.2.8 to 5.1.2.11 of Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement references the assessment presented in section 1.11.2 of Volume 2, Chapter 1: Marine Processes of the Environmental Statement (Document A6.2.1). This states that jack-up operations and cable trenching have the potential to leave scars on the seabed, the persistence of which will depend on the local seabed characteristics and ambient hydrodynamic conditions. The assessment goes on to explain that, where cables are trenched into the underlying Quaternary units, a persistent scar is likely which may potentially be visible for many years. In contrast, in areas where mobile sands and gravels are present, such as are present across the majority of Hornsea Three, including the nearshore area, these scars are likely to be temporary features which would only persist for a period of weeks to months, depending on the local sediment type and hydrodynamic regime.

3.6 The conclusions presented in the Environmental Statement, and particularly those associated with jack-up barge impacts, are informed by monitoring data from jack-up operations during wind turbine installation at the Barrow and Lynn and Inner Dowsing (L&ID) offshore wind farms which demonstrated infilling within a couple of years. Paragraph 5.1.2.10 of Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement outlines that, as the jack-up footprints for Barrow and L&ID are considerably larger than those employed in the nearshore area for HDD exit pits, i.e. an area of 1.2 m^2 for individual jack up footprints associated with Hornsea Three HDD operations in the nearshore (see Table 3.47 of Volume 1, Chapter 3: Project Description of the Environmental Statement; Document A6.1.3), compared with tens of m^2 for jack up footprints at Barrow and L&ID offshore wind farms. These offshore wind farms are also much further offshore than the proposed jack-ups for HDD operations for Hornsea Three offshore cable installation, and therefore it would be expected that the mobile sediments in the vicinity of the Hornsea Three landfall (i.e. driven by higher wave energy) would quickly infill.

Recovery of associated benthic communities

3.7 Paragraph 2.11.1.32 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and paragraph 5.1.2.11 of Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement predict that, as the sediments within trenches and jack-up footprints infill over time and return to a baseline state, the associated faunal communities will recover into these areas.

3.8 The anticipated timescale for the recovery of the subtidal habitats associated with the Cromer Shoal Chalk Beds MCZ (i.e. Subtidal Sand broadscale habitat, characterised by the NcirBat[1] biotope) and The Wash North Norfolk Coast SAC (i.e. supporting habitat for Annex I 'Sandbanks which are slightly covered by seawater all the time', characterised by the NcirBat, MoeVen[2] and SspiMx[3] biotopes) are fully considered in paragraphs 2.11.1.24 *et seq*. of Volume 2, Chapter 2: Benthic Ecology and paragraphs 5.1.2.18 *et seq*. of Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement. These assessments draw on the Marine Evidence based Sensitivity Assessment (MarESA; Tillin, 2016a and 2016b) and are supported by evidence relating to the recovery of benthic communities following aggregate extraction activities (Newell *et al*., 1998; Desprez, 2000; Newell *et al*., 2004) as well as more analogous activities such as the burial of telecommunications cables (Foden *et al*., 2011).

3.9 The assessments highlight that the predominantly sandy sediments found in the nearshore area are typical of high energy environments and are therefore naturally subject to, and tolerant of, high levels of physical disturbance such as that associated with cable burial. The communities that characterise these biotopes are predominantly infaunal mobile species including polychaetes and venerid bivalves, which can re-enter the substratum following disturbance. The recoverability of such communities is likely to occur because of a combination of recruitment from surrounding unaffected areas and larval dispersal, and recovery potential is high and likely to occur within one to five years.

Additional supporting evidence for recovery

3.10 The following sections provide a summary of two additional data sources, which have become available since the submission of the Environmental Statement, which support the conclusions made within Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement, with regards to the recovery of nearshore sediments and associated subtidal benthic habitats. These data sources are as follows:

- Geophysical survey data from where the Dudgeon offshore wind farm and Sheringham Shoal offshore wind farm export cables crossed the Hornsea Three offshore cable corridor, as presented in the Preliminary Environmental Information Report (PEIR); and
- Geophysical survey data at jack-up locations for the Hornsea Three 2018 geotechnical survey in the Cromer Shoal Chalk Beds MCZ.

Recovery of Dudgeon offshore wind farm and Sheringham Shoal offshore wind farm export cables within the Hornsea Three PEIR offshore cable corridor

3.11 During the Evidence Plan process, Natural England have raised questions relating to the impacts that the trenching of the Sheringham Shoal offshore wind farm export cables in 2011, and more recently the Dudgeon offshore wind farm export cables in 2016, has had on the soft sediment habitats within the Cromer Shoal Chalk Beds MCZ.

[1] SS.SSa.IFiSa.NcirBat *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand.
[2] SS.SCS.ICS.MoeVen *Moerella* spp. with venerid bivalves in infralittoral gravelly sand.
[3] SS.SBR.PoR.SspiMx *Sabellaria spinulosa* on stable circalittoral mixed sediment

3.12 Hornsea Three acquired geophysical data along the length of the Hornsea Three offshore cable corridor in 2016/2017 prior to the offshore cable corridor re-route in the nearshore area; this was the offshore cable corridor presented in the PEIR. As the Hornsea Three PEIR offshore cable corridor crossed the Dudgeon and Sheringham Shoal offshore wind farm export cables, this has provided an opportunity for the geophysical data in these areas to be reviewed to look for evidence of recovery of the seabed over the Dudgeon and Sheringham Shoal export cables (including infilling of cable trenches since cable installation and differences in sediment types within/outside trenches).

3.13 Site survey specialists have reviewed and interrogated the geophysical data from nine locations, as shown in Figure 3.1, where the PEIR offshore cable corridor crossed the Dudgeon and Sheringham Shoal offshore wind farm export cables. These included areas which were identified in Figure 3.3 of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement as trenching scars associated with export cable installation for these projects. For each of the locations shown in Figure 3.1, a profile has been produced across the export cables to determine whether remnant trenches are discernible from the data. These profiles provided details on the depth of these remnant trenches and whether sediment changes were evident within the remnant trenches.

3.14 Figure 3.2 and Figure 3.3 present the bathymetry and profiles across two areas (Profile A and Profile B on Figure 3.1) within one of the most visible (from the geophysical data) areas of remnant trench from the installation of the Sheringham Shoal offshore wind farm export cables in 2011. The geophysical data indicates that that the width of the area affected by trenching is approximately 20 m within which the profile of the sediment is reduced, relative to the surrounding sediment, by approximately 40 to 60 cm.

3.15 The side scan sonar (SSS) data over the areas of most visible remnant trench confirmed that, with the exception of only one location (see Figure 3.4), no changes in sediment type are associated with the Sheringham Shoal offshore wind farm export cable remnant trenches. The SSS data in Figure 3.4 shows one area of very marginal coarsening of sediment (higher reflectivity/darker stripe section) in association with a remnant trench. However, all sediments/reflectivity classes were reflective of the surrounding seabed sediments and in this particular example the maximum depth of the trench relative to the surrounding seabed was less than 10 cm.

3.16 Figure 3.5 presents the bathymetry and profiles across the Sheringham Shoal offshore wind farm and Dudgeon offshore wind farm export cables in the nearshore (see Figure 3.1). Interrogation of the geophysical data has not revealed the presence of any remnant trenches following cable installation for these projects in the nearshore environment (i.e. within approximately 500 m of the shore to the east of the Hornsea Three landfall). The apparent reduction in seabed height shown in the profile in Figure 3.5, represents a natural bedform and is not associated with the export cables of either of the projects. This clearly highlights that there are natural bedforms in the nearshore environment that produce drops in seabed levels considerably larger than the remnant trenches described above in paragraph 3.13.

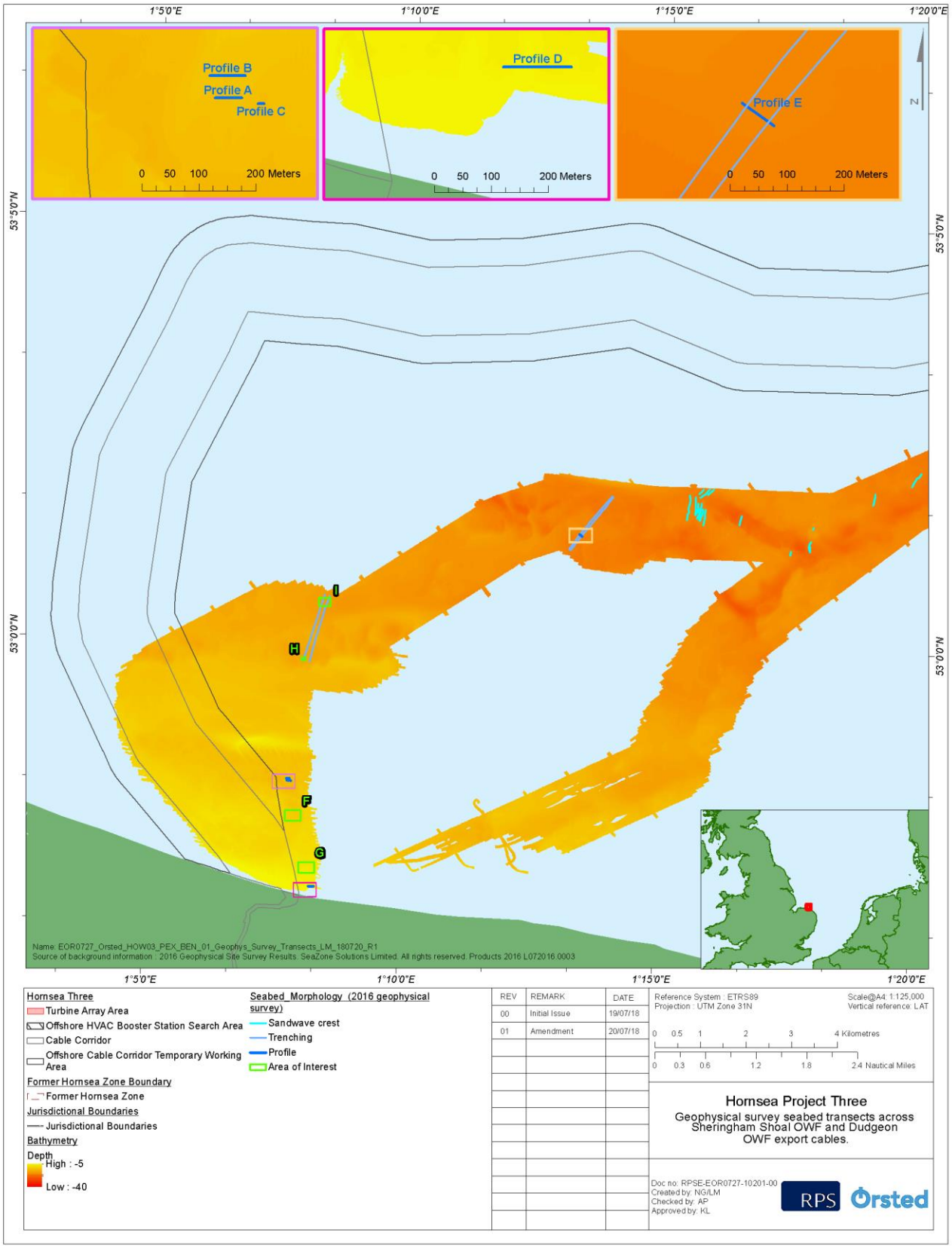


Figure 3.1: Bathymetry over the Hornsea Three and locations of the geophysical data interrogation profiles across the Sheringham Shoal offshore wind farm and Dudgeon offshore wind farm export cables.

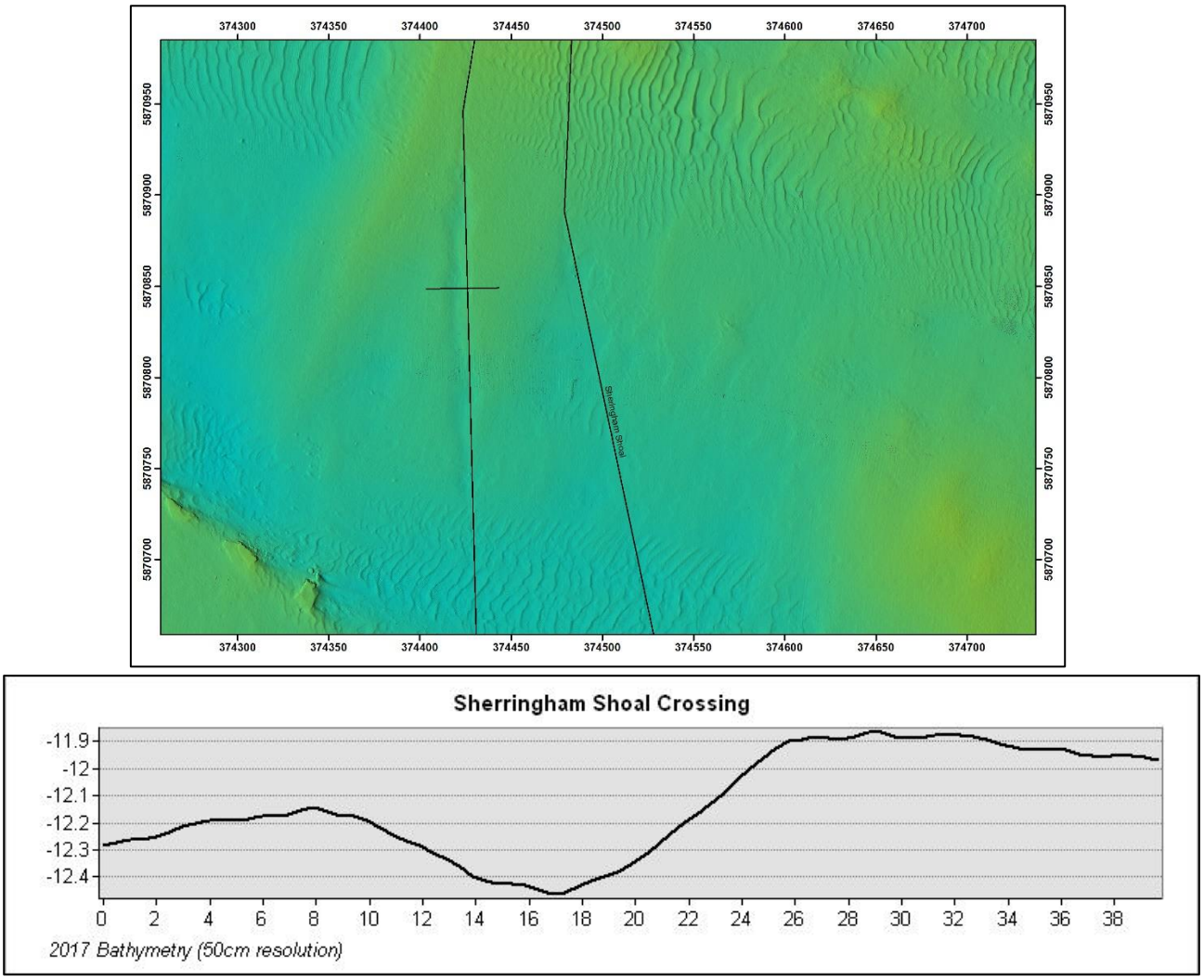


Figure 3.2: Bathymetry (top) and profile (bottom; distance along seabed in metres (x-axis) and depth of seabed in metres (y-axis)) over an area of remnant trench from the Sheringham Shoal offshore wind farm export cable installation approximately 2.5 km offshore (see Profile A in Figure 3.1).

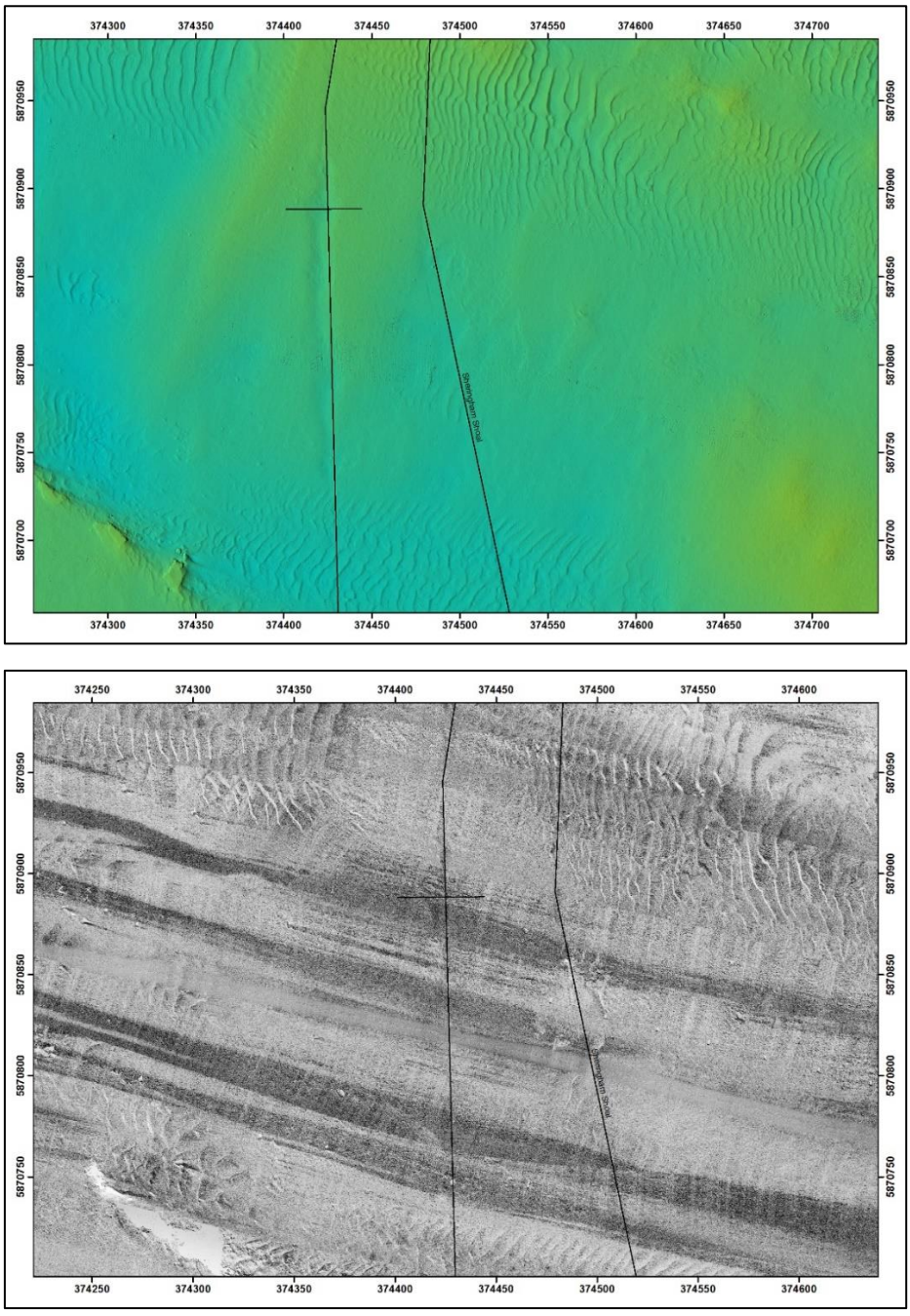
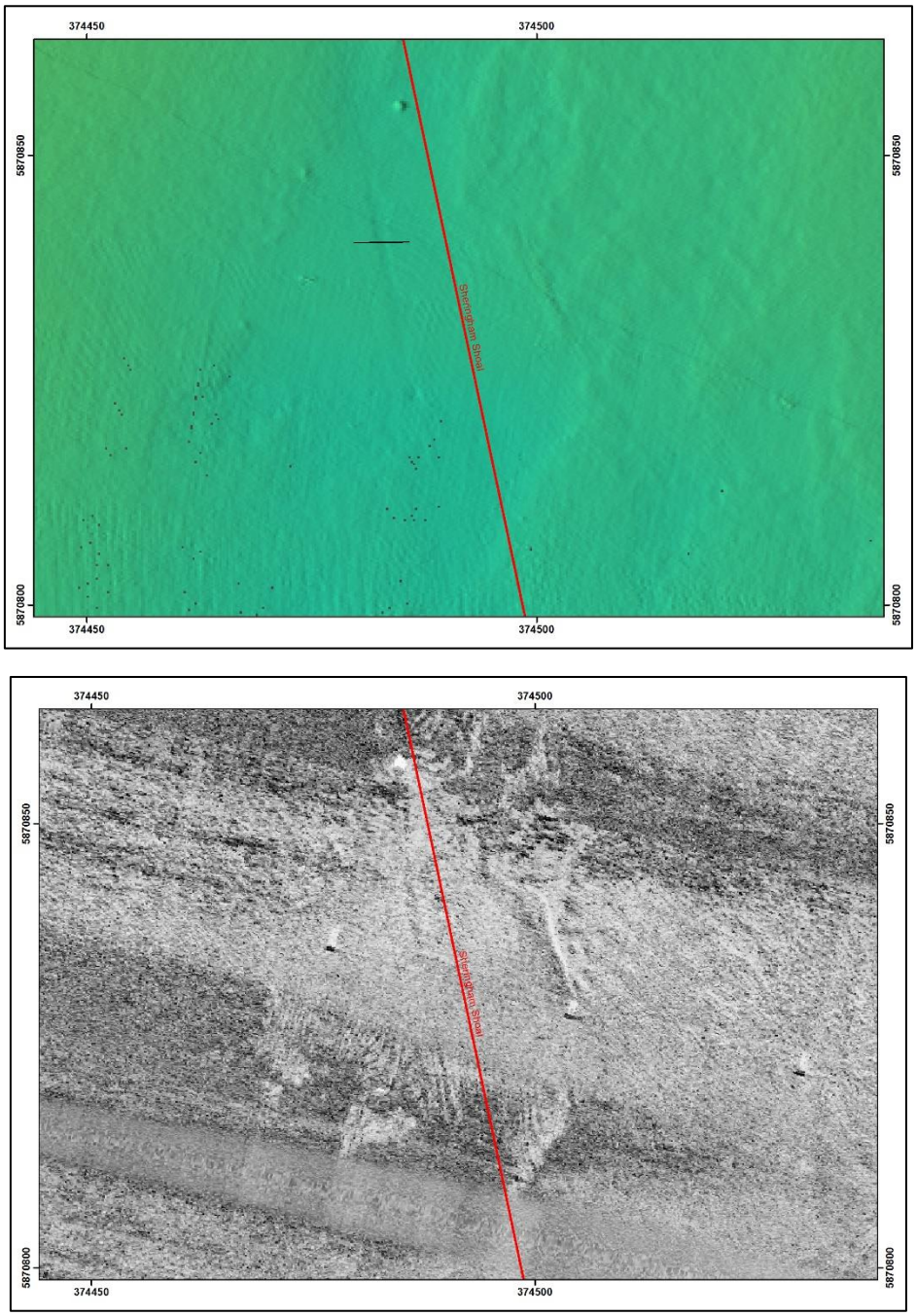


Figure 3.3: Bathymetry (top), side scan sonar (middle) and profile (bottom; distance along seabed in metres (x-axis) and depth of seabed in metres (y-axis)) over an area of remnant trench from the Sheringham Shoal offshore wind farm export cable installation approximately 2.5 km offshore (see Profile B in Figure 3.1).



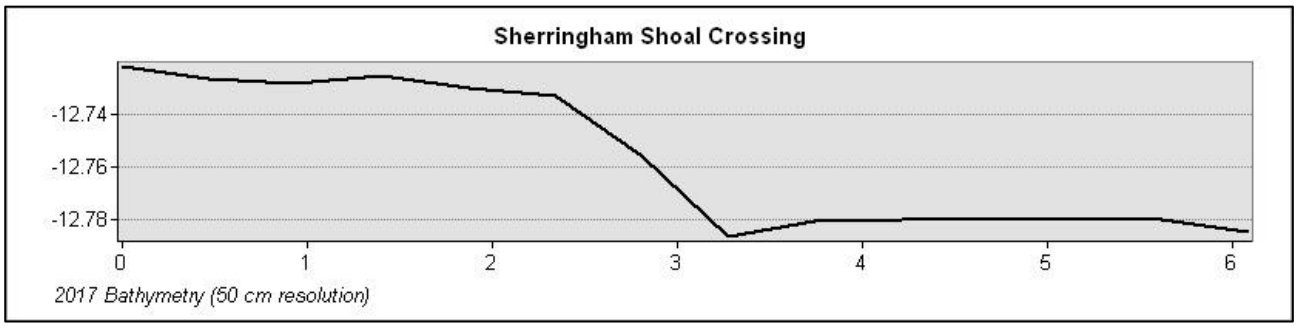


Figure 3.4: Bathymetry (top), side scan sonar (middle) and profile (bottom; distance along seabed in metres (x-axis) and depth of seabed in metres (y-axis)) over an area of remnant trench from the Sheringham Shoal offshore wind farm export cable installation approximately 2.5 km offshore (see Profile C in Figure 3.1).

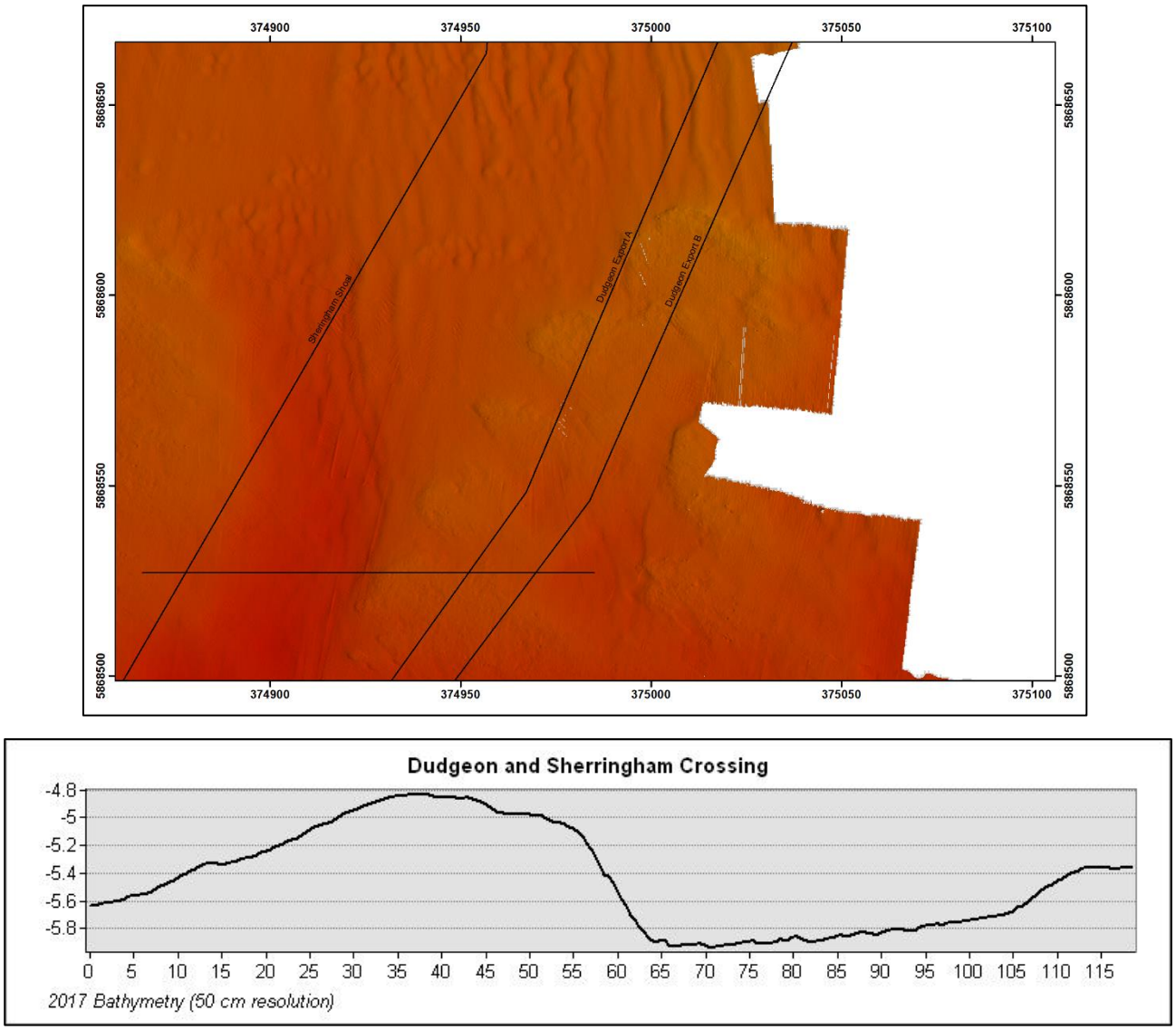


Figure 3.5: Bathymetry (top) and profile (bottom; distance along seabed in metres (x-axis) and depth of seabed in metres (y-axis)) over Sheringham Shoal offshore wind farm and Dudgeon offshore wind farm export cables in the nearshore (<500 m offshore; see Profile D in Figure 3.1).

3.17 Figure 3.6 presents the bathymetry and profiles across remnant trenches from the installation of the Dudgeon offshore wind farm export cables in 2016 (Profile E on Figure 3.1). The geophysical data indicates that that the width of each area affected by trenching is approximately 10 m within which the profile of the sediment is only marginally reduced, relative to the surrounding sediment (i.e. by approximately 10 to 20 cm). Given that the geophysical data shown in Figure 3.6 was collected in 2016, the situation shown represents the state of the seabed less than one year following cable installation. On this basis, rapid recovery of the topography of the seabed has occurred within a matter of months.

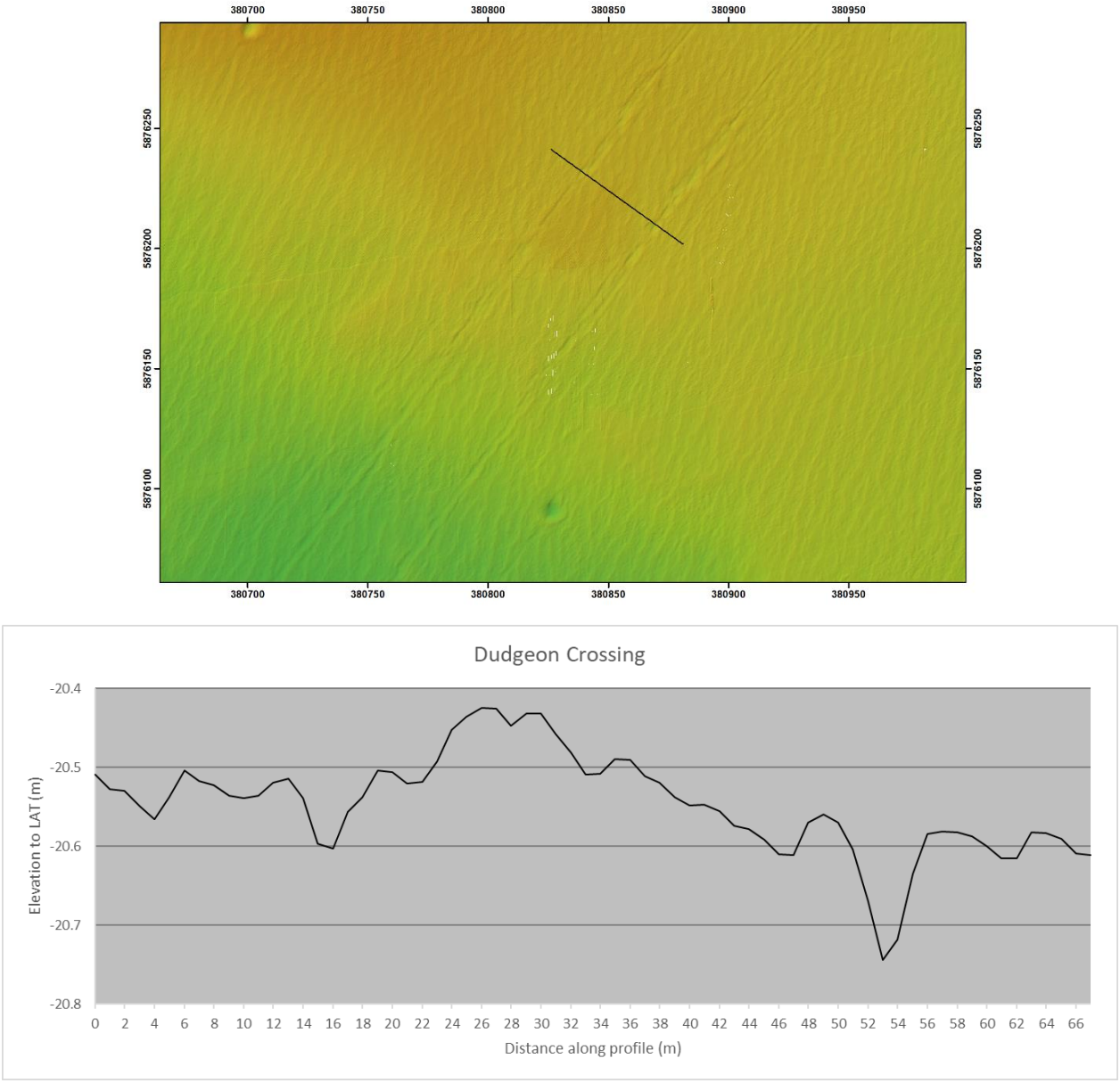


Figure 3.6: Bathymetry (top) and profile (bottom; distance along seabed in metres (x-axis) and depth of seabed in metres (y-axis)) over Dudgeon offshore wind farm export cables approximately 8.5 km offshore (see Profile E in Figure 3.1).

3.18 Figure 3.7, Figure 3.8, Figure 3.9 and Figure 3.10 present the bathymetry over the Sheringham Shoal offshore wind farm export cables at various distances offshore (see Figure 3.1). Interrogation of the geophysical data indicates complete burial of these cables beneath the bedforms and no change in bedform pattern as a result of cable trenching. Furthermore, there is no evidence of any wider alteration to seabed features beyond the very small immediate area, within which cables have been installed.

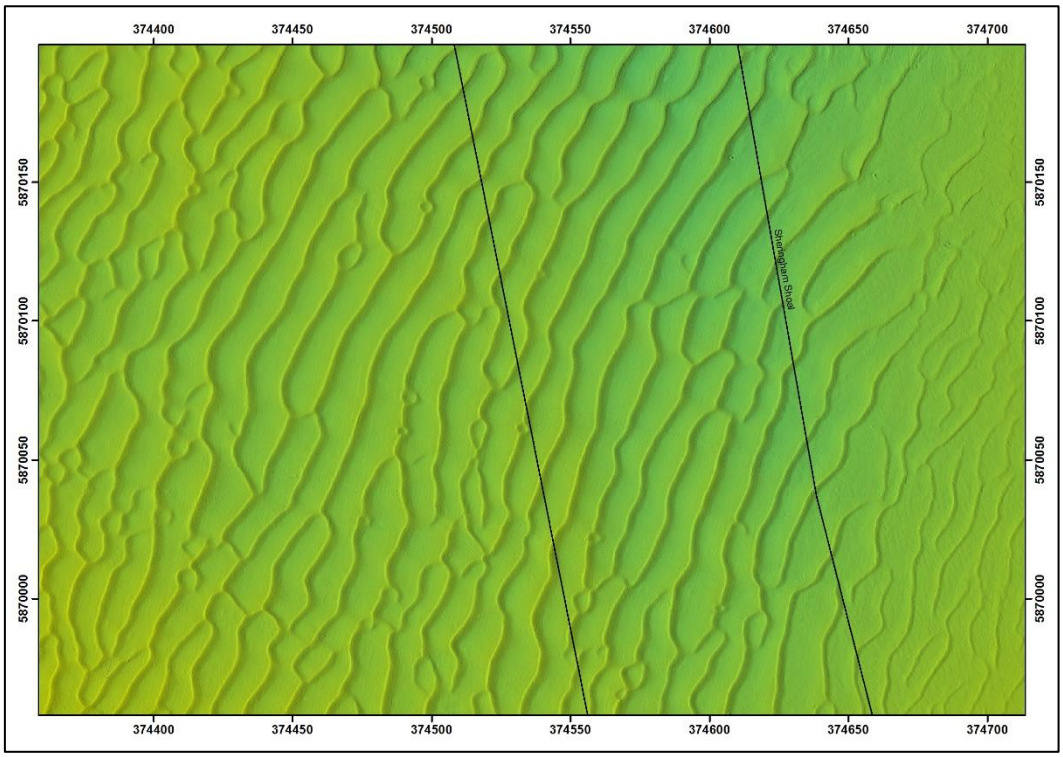


Figure 3.7: Bathymetry over Sheringham Shoal offshore wind farm export cables approximately 1.5 km offshore (see Area F in Figure 3.1).

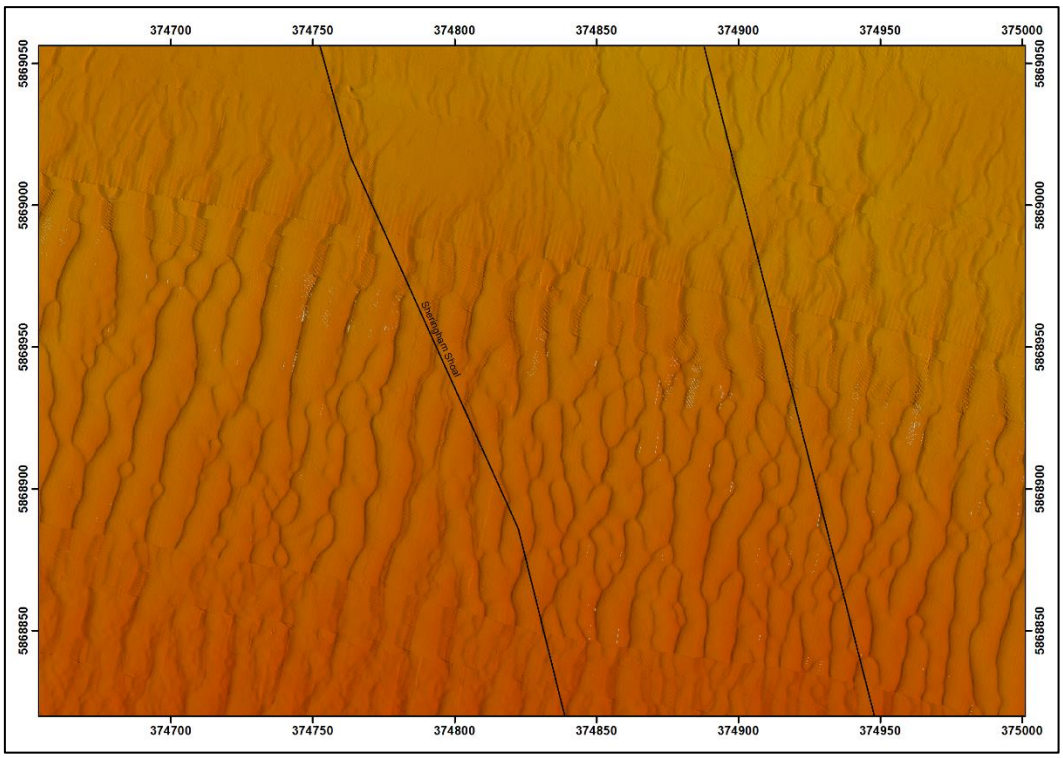


Figure 3.8: Bathymetry over Sheringham Shoal offshore wind farm export cables in the nearshore (see Area G in Figure 3.1 approximately 500 m offshore).

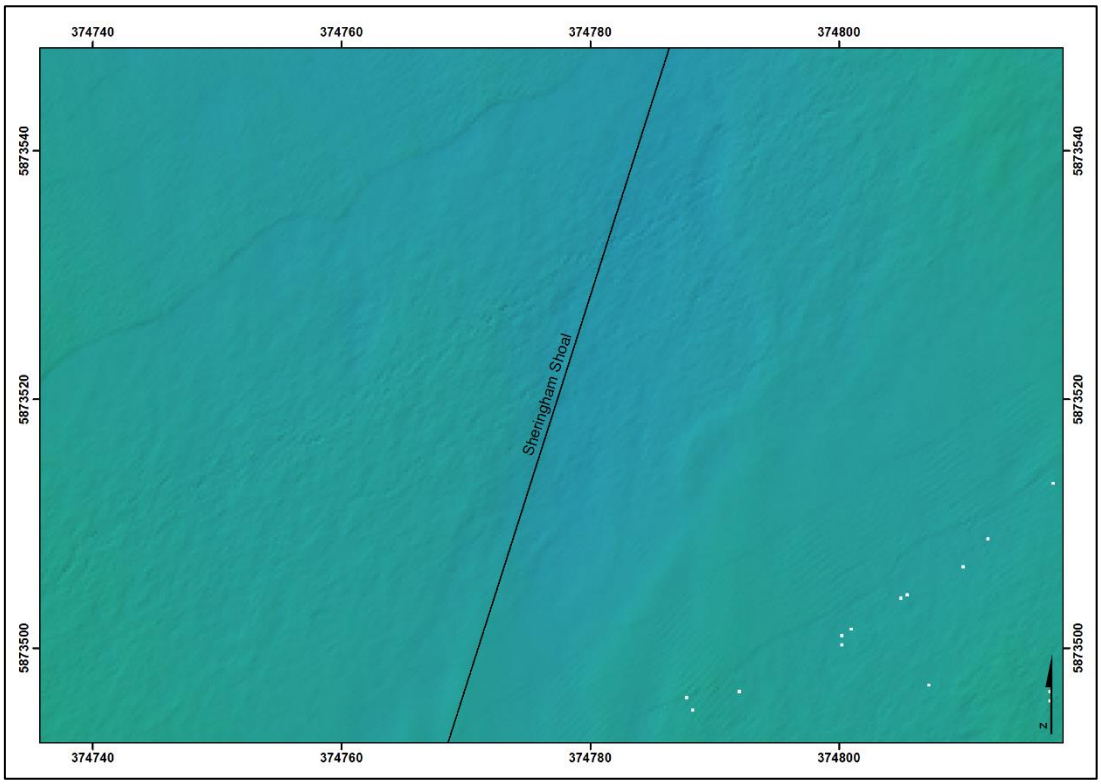


Figure 3.9: Bathymetry over Sheringham Shoal offshore wind farm export cable approximately 5 km offshore (see Area H in Figure 3.1).

3.19 Figure 3.10 presents the bathymetry over the Sheringham Shoal offshore wind farm in Area H in Figure 3.1. The geophysical data shows minor remnant trenching from the cable installation but no change in bedforms in the offshore environment as a result of cable trenching.

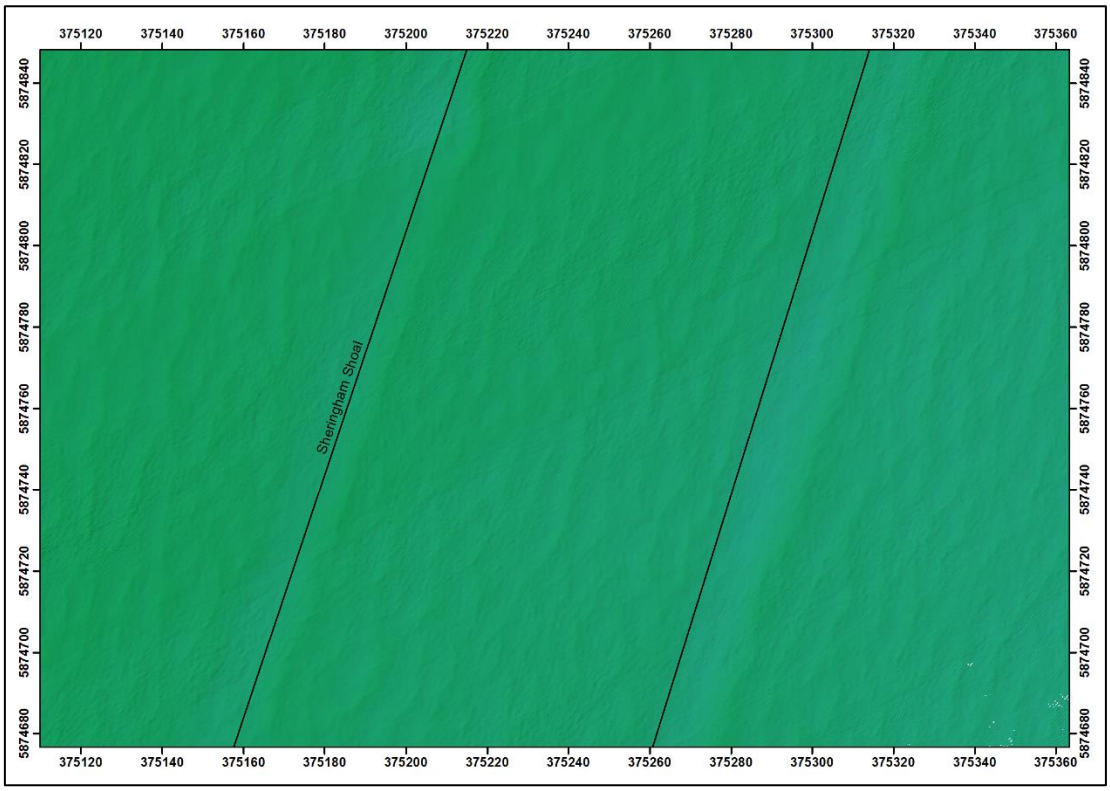


Figure 3.10: Bathymetry over Sheringham Shoal offshore wind farm export cable approximately 6 km offshore (see Area I in Figure 3.1).

Recovery of jack-up footprints in the Cromer Shoal Chalk Beds MCZ

3.20 In March and April 2018, Hornsea Three undertook a geotechnical survey within the Cromer Shoal Chalk Beds MCZ. Cone penetration test (CPT)/borehole samples were collected at six locations using a jack-up vessel which placed four legs on the seabed at each sampling location (i.e. a total of 24 jack-up footprints across the six survey areas).

3.21 During the marine licence application process for these works, Natural England and the MMO raised questions about the impact that jack-up operations associated with the geotechnical works would have on subtidal soft sediments within the Cromer Shoal Chalk Beds MCZ and the potential for recovery of these sediments. A condition of the marine licence (*L/2018/00044/1*), which was awarded on the 30th of January 2018, required Hornsea Three to complete a survey of the jack-up barge feet locations at each survey location within the Cromer Shoal Chalk Beds MCZ using either multibeam echo sounder (MBES) and/or backscatter geophysical survey equipment.

3.22 Hornsea Three undertook a MBES survey of the six CPT/borehole locations in May 2018, less than two months after the geotechnical survey had been completed. Data was collected over six x 60 m diameter areas centred on jack-up locations within the Cromer Shoal MCZ. Across the six MBES survey locations (and 24 potential jack-up footprints), a total of four targets were recorded and, of these, only two were deemed to be footprints left by a jack-up vessel.

3.23 The dimensions of the two jack-up footprints are outlined in Table 3.1 and the point cloud images for each target are shown in Plate 3.1. These show that the deepest point of each jack-up footprint, less than two months after completion of the geotechnical survey, was estimated as 16 cm. Plate 3.1 also demonstrates that around the edge of the footprint depression there are raised areas which correlate with the areas where sediment has been pushed out from underneath the jack-up foot.

3.24 This survey demonstrates that full recovery of all but two of the 24 jack-up footprints has occurred in the months since completion of the geotechnical survey, with the other two footprints recorded showing good signs of recovery (i.e. these two jack-up footprints have almost completely infilled).

3.25 These results support the conclusions made within Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement that jack-up footprint indentations will infill over time and that they will infill more quickly than jack-up footprints in less mobile sediments further offshore (e.g. jack-up operations from wind turbine installation at the Barrow and L&ID offshore wind farms).

3.26 The results of the Hornsea Three jack-up footprint monitoring in the Cromer Shoal Chalk Beds MCZ therefore provide valuable evidence, from comparable activities in the relevant geographical location (i.e. same sediments and coastal processes regime etc.), to support the predictions made in the Environmental Statement regarding the recovery of the seabed within jack-up footprints as a result of the HDD operations in the nearshore.

Table 3.1: Dimensions of the two jack-up barge footprints recorded during the May 2018 multibeam echo sounder.

Target ref	Target area	Least depth (m)	Bed depth (m)	Scour depth (m)	Dimensions L x B x H (m)
#1	CPT3	-7.84	8.1	0.16	1.4 x 1.4 x 0.4
#2	CPT3	-7.99	8.0	0.16	1.4 x 1.4 x 0.2

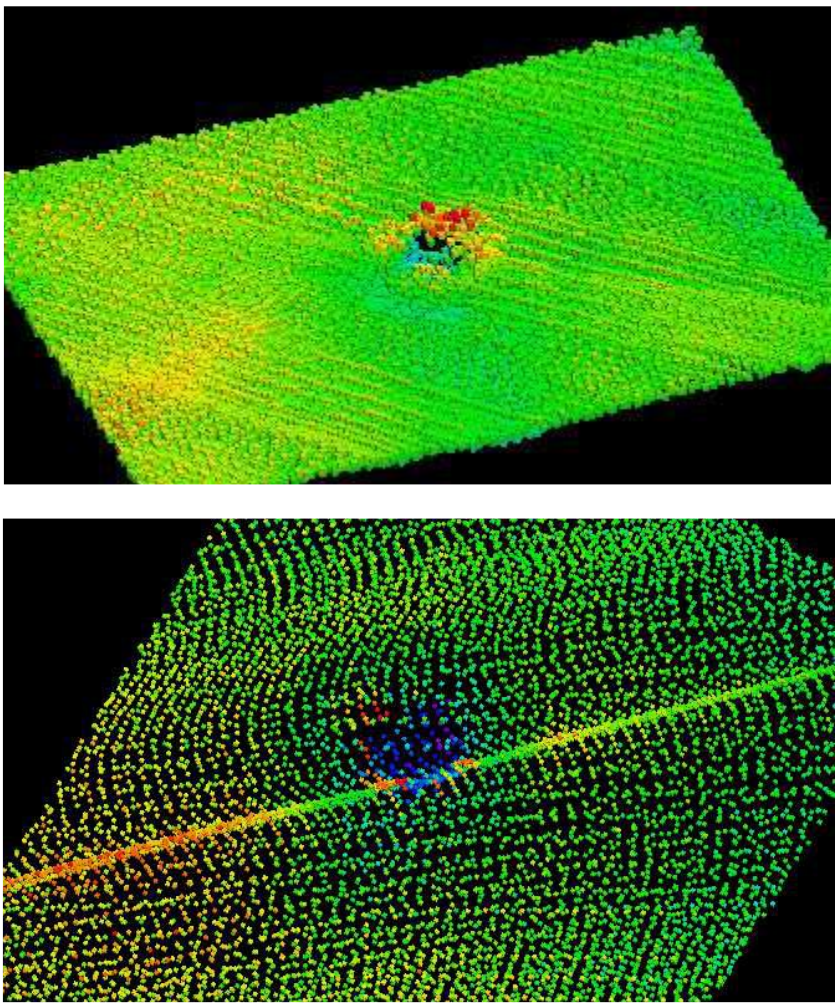


Plate 3.1: Point cloud images of Target #1 (top) and Target #2 (bottom) at CPT3 location.

Conclusions

3.27 This section of the Clarification Note has been drafted in response to Natural England comments on recovery of seabed sediments in nearshore areas following cable installation (see paragraph 1.3 of this note) and draws on relevant monitoring and observations from the nearshore section of the Hornsea Three offshore cable corridor in order to validate the assessment presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

3.28 Detailed interrogation of the Hornsea Three geophysical data has demonstrated complete burial of the Dudgeon offshore wind farm export cables beneath bedforms in the nearshore area coinciding with the Hornsea Three PEIR offshore cable corridor and the rapid recovery of the sediments further offshore such that the remnant trenches, within months of the cable installation activities taking place, were minimal depressions of less than 20 cm. There is no evidence of the trenching works undertaken for the installation of these export cables in the nearshore (i.e. within approximately 500 m of the shore). Therefore, it is concluded that the seabed has recovered since the Dudgeon offshore wind farm export cables were installed in 2016 and, in the most part, it recovered within one year.

3.29 The geophysical data shows evidence of remnant trench scars from the installation of the Sheringham Shoal offshore wind farm export cables in 2011, approximately 2.5 km offshore. However, detailed analysis of the bathymetry data has demonstrated that these remnant trench scars are shallow sided depressions of up to a maximum depth of approximately 40 cm to 60 cm in the middle of the trench relative to the surrounding sediment over a trench width of up to approximately 20 m. It should be noted that, as the remnant trenches are shallow sided, the majority of the trenches are considerably shallower than these maximum depths. Importantly, with respect to the likely associated recovery of the benthic communities associated with these sediments, there is little evidence of any change in sediment type associated with these remnant trenches. Furthermore, the geophysical data has demonstrated that there are natural bedforms in the nearshore environment that produce changes in seabed levels which are considerably larger than the remnant trenches observed. Therefore, although there is evidence of remnant trenching offshore, the relatively small depth of the depressions when considered in the context of the wider area and the presence of natural bedforms of similar magnitude, and the consistency with surrounding sediments indicate that the remnant trenches can be considered to have recovered. As outlined in paragraph 2.11.1.32 of Volume 2, Chapter 5: Benthic Ecology of the Environmental Statement, monitoring at the Lynn and Inner Dowsing offshore wind farm recorded persistent jack-up barge footprints which were still observed on the seabed three years post construction. However, monitoring of footprints showed that despite the visible footprints, the benthic community showed clear signs of recovery with a high degree of similarity in the infaunal assemblage within and outside the footprints.

3.30 In the nearshore environment (i.e. within approximately 500 m of the shore) and the vast majority of the rest of the Sheringham Shoal offshore wind farm export cable corridor, the cables were found to be completely buried under bedforms and there is no evidence of the installation trenching works (i.e. full recovery since installation in 2011).

3.31 The greater persistence of the offshore remnant trenches associated with the Sheringham Shoal offshore wind farm cables installed in 2011 compared to the offshore sediments associated with the Dudgeon offshore wind farm export cables installed more recently in 2016, although counterintuitive, may partly be explained by the sediment types in these areas (other factors influencing recovery may include sediment transport processes and hydrodynamic regime in the locality). The geophysical seabed interpretation data, as presented in Figure 3.3 of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement (Document A6.5.2.1), indicates that the sediments associated with the offshore section of the Sheringham Shoal offshore wind farm export cables considered in this Clarification Note are sandy gravels whereas the Dudgeon offshore wind farm exports cables are gravelly sands; the latter would be expected to recover more quickly. As outlined in paragraph 2.11.1.28 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement, the recovery of gravel communities to dredging activities has been shown to take up to nine years (Foden *et al*., 2009). As noted in paragraph 3.30 above, the recovery of these sediments is indicated by the fact that there are no differences in sediment type within the remnant trenches compared to outside the trenches. As shown in Figure 3.3 of Volume 5, Annex 2.1: Benthic Ecology Technical Report of the Environmental Statement, the Hornsea Three nearshore environment is predominantly characterised by sand and gravelly sand sediments with discrete areas of more gravelly sediments characterised by sandy gravels. Therefore, recovery of the Hornsea Three sediments may be more in line with those observed for the Dudgeon offshore wind farm export cables in gravelly sands (i.e. recovery within a matter of months). In either case outlined above, i.e. recovery of sediments within months, as per the relevant section of the Dudgeon offshore wind farm export cable, or a less rapid recovery over a period of years, for the relevant section of the Sheringham Shoal offshore wind farm export cable, both scenarios are consistent with the predictions made within paragraphs 2.11.1.27 to 2.11.1.28 of Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

3.32 The results of the Hornsea Three jack-up footprint monitoring in May 2018 provide additional evidence to support the conclusions presented in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement and Volume 5, Annex 2.3: MCZ Assessment of the Environmental Statement relating to the recovery of benthic sediments. It is worth noting that these data indicate more rapid recovery of sediment topography (i.e. within a couple of months) than the data from offshore environments, as presented in the Environmental Statement, indicates (i.e. within a couple of years). On this basis, it is reasonable to assume that once the sediment topography is restored, the associated benthic communities will recover as predicted in Volume 2, Chapter 2: Benthic Ecology of the Environmental Statement.

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