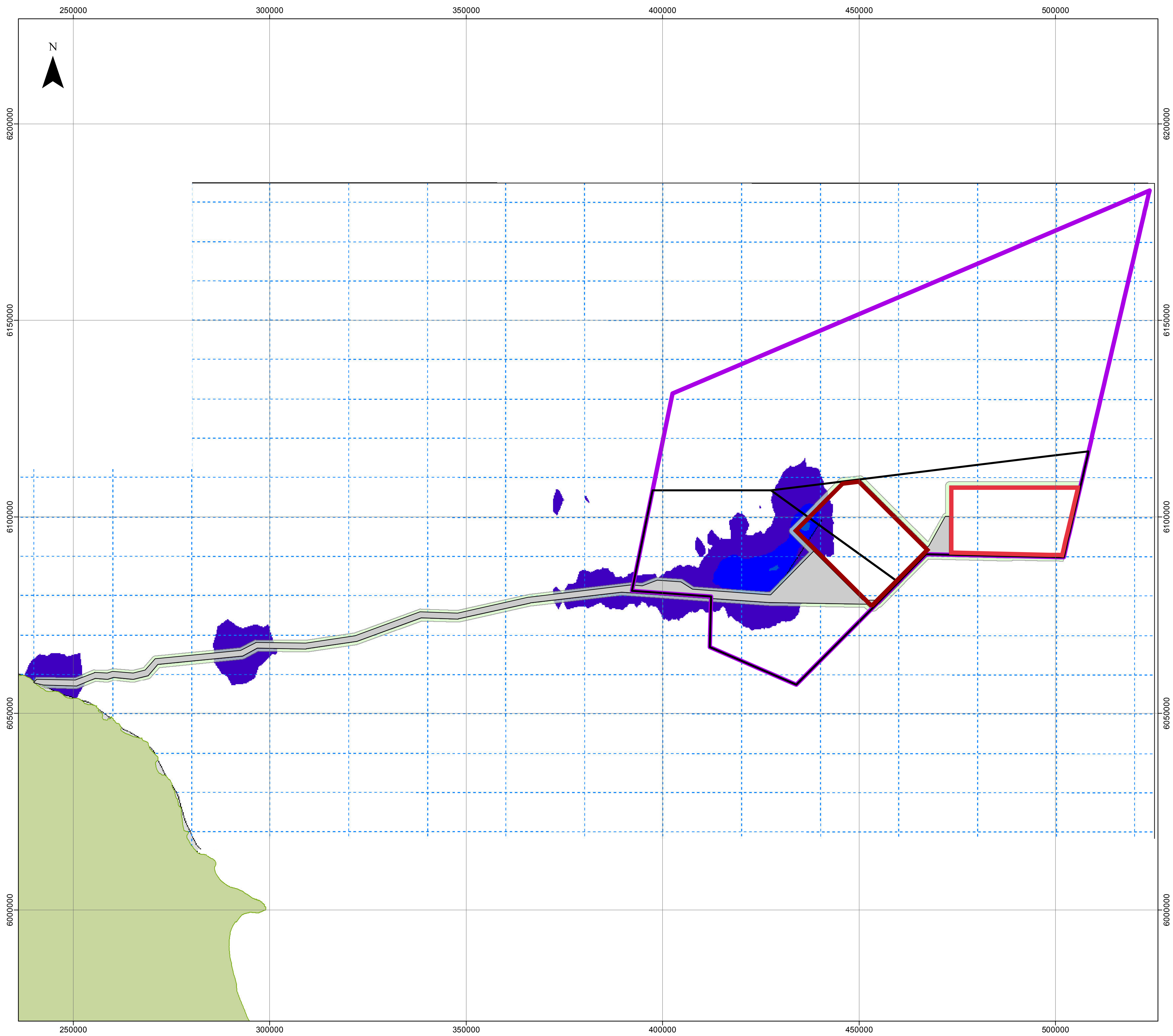


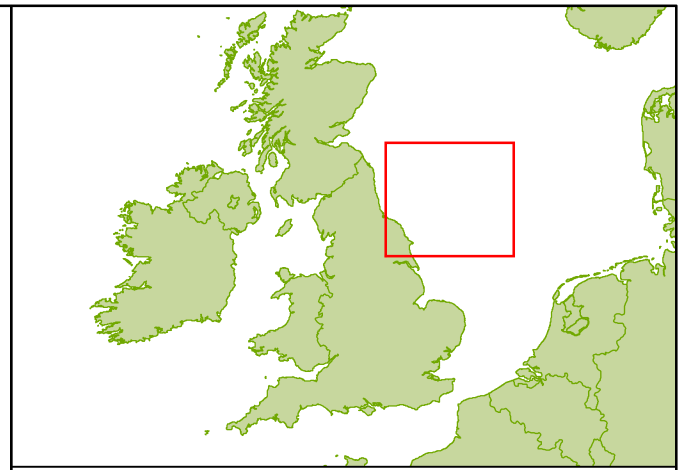

**LEGEND**

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside A & B Export Cable Corridor
- Temporary works area

Exeedance of 100 mg/l

- Above 0.900
- 0.800 - 0.900
- 0.700 - 0.800
- 0.600 - 0.700
- 0.500 - 0.600
- 0.400 - 0.500
- 0.300 - 0.400
- 0.200 - 0.300
- 0.100 - 0.200
- 0.001 - 0.100
- Below 0.001
- Undefined Value

0 10 20 40
Kilometres

Data Source:
Sediment Samples © Gardline Environmental Limited, 2012
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

*DOGGER BANK TEESSIDE A & B*

DRAWING TITLE

**Figure 5.1 Fraction of time (expressed as % of 30 day modelling period) where suspended sediment concentration of 100mg/l is exceeding in the bottom layer during construction**

| VER | DATE | REMARKS | Drawn | Checked |
|---|---|---|---|---|
| 1 | 07/02/2014 | Pre DCO Submission | JE | RZ |
| | | | | |
| | | | | |

DRAWING NUMBER:

**F-OFL-MA-266**

| SCALE | 1:1,000,000 | PLOT SIZE | A3 | DATUM | WGS84 | PROJECTION | UTM31N |
|---|---|---|---|---|---|---|---|



FOREWIND

6.3.19. The predicted bed thickness at the end of the 30-day simulation was equal to or less than 0.1mm across the whole of the footprint. This latter statement is important because it indicates the lack of potential for any “additive” effect of sediment deposition in parts of the site and, therefore, the maximum depths outlined above represent the actual maximum values predicted to arise.

6.3.20. In terms of impact on benthic and epibenthic communities, any increase in suspended sediment concentration (and sedimentation) would have different effect depending on the nature of the species affected. Deposit feeders, including many polychaetes, are likely to favour an increase in sedimentation as this can often lead to introduction of organic materials from a greater proportion of fine sediments in the substrate. In contrast, suspension (filter) feeders, which will form part of more diverse epibenthic communities within the site, will be more sensitive to increased suspended sediment concentration as this may have adverse impacts on fitness (due to clearing fine sediment from pores and canals (Jackson and Hiscock 2008).

6.3.21. Based on sensitivity assessments provided by MarLIN, of the three main VERs identified within the boundaries of Dogger Bank Teesside A & B (where the greatest increases in suspended sediments and sedimentation (smothering) are predicted to arise), VER A is judged to be not sensitive to increased suspended sediment concentrations and smothering whilst VER B has a very low sensitivity to both these effects. VER C has a very low sensitivity to increased suspended sediments and is not sensitive to smothering.

6.3.22. In terms of overall (EIA) sensitivity of VERs A, B and C to increased suspended sediment concentration, based on **Table 3.3** this is judged to be negligible for VER A and low for VER B and C.

6.3.23. In terms of the magnitude of this effect (increased suspended sediment), based on the criteria in **Table 3.4**, this is judged to be low as although the spatial extent of any will be large (>10% of the study area), the effect of increased suspended sediments are not judged to occur continually and no change in the distribution of biotopes across either Dogger Bank Teesside A or Dogger Bank Teesside B is also predicted.

6.3.24. Therefore, for the three VERs in Dogger Bank Teesside A & B, the negligible/low sensitivity of these receptors to increased suspended sediments and the low magnitude of effect results in a **negligible** impact.

6.3.25. For the remaining VER’s D to I, i.e. those present within the Dogger Bank Teesside A & B Export Cable Corridor and outside the boundary of the cSAC, these also exhibit either very low or no sensitivity to increased suspended sediments and based on criteria in **Table 3.3** are judged to have a negligible (EIA) sensitivity to this effect.

6.3.26. In terms of the magnitude of the effect in question, based on the criteria in **Table 3.4**, this is judged to be low, resulting in a **negligible** impact on all of the VERs along the Dogger Bank Teesside A & B Export Cable Corridor via increased suspended sediment concentrations produced via construction.

6.3.27. In terms of sedimentation (smothering) within the main Dogger Bank Teesside A & B site boundaries, VERs A and C are judged to be not sensitive to this effect, resulting in a negligible (EIA) sensitivity, with VER B having a very low ecological sensitivity and thus, a low sensitivity in EIA terms. The lack of sensitivity of biotopes within the Dogger Bank Teesside A & B site to smothering effects reflects the fact that these areas will be subject to smothering effects under existing conditions, via winter storm events and also exposure to bottom trawling activities and, therefore, these biotopes are adapted to this effect.

6.3.28. The magnitude of effect is also judged to be low based on the criteria in **Table 3.4** as changes in the biotope distribution of the wind farm sites via smothering effects are not predicted. Therefore, a, **negligible** impact on all VER's within the wind farms is predicted via sedimentation (smothering).

6.3.29. With respect to the Dogger Bank Teesside A & B Export Cable Corridor, the same conclusions apply with regard to sensitivity as per the VERs within the wind farms, i.e. low sensitivity to smothering. The magnitude of effect is also assessed as low, although it is noted that any sedimentation effects via cable installation will be even less than those noted within the wind farms via foundation and cable installation. Therefore, a **negligible** impact is predicted on benthic habitats (VERs D to I) within the Dogger Bank Teesside A & B Export Cable Corridor due to sedimentation produced via the construction process.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

6.3.30. As set out in **Chapter 5**, Dogger Bank Teesside A & B may either be constructed simultaneously, or sequentially with a gap between construction. Should construction of both projects take place at the same time, there is the potential for increased levels of effect due to the potential interaction of sediment plumes and their deposition on the seabed.

6.3.31. However, given the conclusions drawn from the modelling studies for each project in isolation (namely that any increases in suspended sediment concentration and sedimentation will be low level and short-lived, and the receptors are of low sensitivity to the effect), additional impacts from the construction of both projects together are unlikely. Any impacts are predicted to remain as **negligible**.

## 6.4. Release of sediment contaminants resulting in potential effects on benthic ecology

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

6.4.1. The mobilisation of sediments via the same processes outlined in preceding impact assessments, i.e. cable installation, seabed preparation and foundation installation, could lead to the release of any contaminants that may be present within the sediments.

6.4.2. Data on contaminant levels within the main Dogger Bank Teesside A & B wind farm sites and the Dogger Bank Teesside A & B Export Cable Corridor were obtained via site-specific surveys. These data indicate that the levels of contaminants in the offshore wind farm areas where sediment re-suspension concentrations are predicted to be the largest (via foundation installation and cable installation), is relatively low i.e. the majority of the contaminant levels are below the Cefas Action Level 1 and Canadian Sediment Quality Guidelines TEL values.

6.4.3. Within the main Dogger Bank Teesside A & B sites, the three VERs present (VERs A, B and C) have low and moderate ecological sensitivities (as defined by MarLIN) to contamination via synthetic compounds, heavy metals and hydrocarbons. Based on criteria in **Table 3.3**, the overall sensitivity of these receptors is judged to be medium as although they are internationally important habitats, they will exhibit at least a medium recoverability to this effect should it ever arise.

6.4.4. Based on **Table 3.4**, the magnitude of this effect is judged to be negligible due to the low level of contaminants recorded within the main sites, therefore, an overall impact of **negligible** significance is predicted on the benthic receptors (VERs A, B and C) within the main sites due to contamination from sediments mobilised in the construction phase.

6.4.5. With regard sediment contaminant levels from within the Dogger Bank Teesside A & B Export Cable Corridor, these are generally higher than within the wind farm sites, particularly in locations nearer the coast where sample sites exceeded Cefas AL1.

6.4.6. Similarly to the VERs within the main wind farm sites, the receptors present within the Dogger Bank Teesside A & B Export Cable Corridor (VERs A to I) have ecological sensitivities to contamination ranging from low to moderate (based on MarLIN sensitivities). The overall sensitivity of the receptors within the cable corridor is judged to be low based on the criteria in **Table 3.3**.

6.4.7. Even though sediment contaminant levels are higher in the nearshore cable area compared to the offshore wind farm sites, the magnitude of any potential contaminant re-mobilisation effect is judged to be low due to the much lower levels of sediments likely to be mobilised via construction in this area compared to levels of sediment release within the main wind farm sites via seabed preparation associated with foundations). Therefore, the combination of low receptor sensitivity and low magnitude of effect results in a **minor adverse** impact being predicted on benthic receptors along the Dogger Bank Teesside A & B Export Cable Corridor via sediment contaminant re-mobilisation.

## Dogger Bank Teesside A and Dogger Bank Teesside B together

6.4.8. As set out in **Chapter 5**, Dogger Bank Teesside A and Dogger Bank Teesside B may either be constructed simultaneously or sequentially with a gap between construction. Should construction of both projects take place at the same time, there is the potential for interaction of sediment plumes and their deposition on the seabed.

6.4.9. Should deposition from construction activities of the two projects (Dogger Bank Teesside A & B) occur in the same area, there is the potential that benthic receptors in these areas may be subject to increased levels of contaminants.

6.4.10. However, given the conclusions drawn from the modelling studies for each project in isolation (namely that any increases in suspended sediment concentration and sedimentation will be low level and short-lived, and the fact that the receptors within the wind farm sites are judged to have an overall low (EIA) sensitivity to this effect, additional impacts of sediment contamination on VERs A, B and C in the wind farm sites from the construction of both projects together are unlikely. Any impacts are predicted to remain as **negligible**.

6.4.11. The same principle applies with respect to potential liberation of contaminated sediments from installation of the export cable, therefore, a **minor adverse** impact is predicted to arise.

## 6.5. Increased suspended sediment concentration leading to impacts on plankton and primary productivity

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

6.5.1. Phytoplankton production on the Dogger Bank occurs throughout the year supporting a high biomass of species at higher trophic levels year-round (Section 4).

6.5.2. As outlined in the previous impact statement, the construction phase of this project will lead to an increase in suspended sediment concentration via foundation installation and cable installation within the wind farm and cable installation within the Dogger Bank Teesside A & B Export Cable Corridor.

6.5.3. Whilst the potential impacts of these effects on benthic habitats are assessed above, this assessment addresses the potential for increased suspended sediment concentration, and the consequent increase in turbidity produced as a result, to create adverse impacts on phytoplankton and hence, primary productivity.

6.5.4. A detailed assessment of the impact on increased suspended sediment concentration and related turbidity on phytoplankton production in the Dogger Bank region is not possible, due to a lack of specific data on the sensitivity of phytoplankton assemblages to different levels of suspended sediment concentrations. However, it is possible to state, in a relatively broad sense that increased suspended sediment concentration, and the resultant increase in turbidity, can adversely affect phytoplankton productivity, due to the reduction in light penetration through the water column. From the outputs of the modelling work done in relation to suspended sediment concentration, increases of >200 mg/l above baseline suspended sediment concentration can be noted in the construction phase, which has the potential to create adverse effects on phytoplankton.

6.5.5. However, the spatial extent of any such increases are small when compared to the wider North Sea region, or even the wider Dogger Bank feature itself, which is noted to be a particular focus for primary production, even in winter months. As such, any temporary increases created via the construction phase are predicted to create a **negligible** impact.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

6.5.6. If Dogger Bank Teesside A & B are built together the spatial extent of any increases in suspended sediment concentration (and turbidity) will be greater than when either project is built in isolation. However, when built together only half the number of wind turbines would be constructed at the same time in each individual site. From this it follows that the actual increase in suspended sediment concentration (and turbidity) are likely to be lower in both sites when Dogger Bank Teesside A & B are built together than when either project is built alone. Taking the above in to account the same predictions of **negligible** impact that were predicted for the in isolation scenario apply for the build together scenario.

## 6.6. Physical disturbance to intertidal habitats and species during landfall works

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

6.6.1. HDD will be undertaken at the landfall in order that marine export cables and terrestrial export cables can be joined. There will also be a need to construct a joint transition bay to enable cable jointing works to take place. The main uncertainties in the construction methodology are where and how the HDD component of the onshore cables will be connected to the landing points of the export cables at the coast.

6.6.2. There are three potential exit points for HDD in the nearshore zone:

- On the beach, above the high water mark;
- In the intertidal zone between the low water and high water marks; and
- Offshore in the subtidal zone seaward of the low water mark.

6.6.3. Whichever option is chosen, there will be temporary disturbance to intertidal habitats at the landfall via construction of these joint transition bays, which are likely to be maintained by the use of temporary coffer dams. There will also be a need for open-cut trenching on the beach to bury cables, with a maximum working width of 10m (x300m beach length) assumed for EIA.

6.6.4. The MarLIN factor relevant to this impact, and, therefore, used to inform this assessment is “physical disturbance and abrasion”.

6.6.5. Scenarios for a single project only (Dogger Bank Teesside A or Dogger Bank Teesside B) are assumed to require installation of either two small cofferdams (10m x 10m x 3m) or one large cofferdam (15m x 10m x 3m) over a two-month period, with two small cofferdams creating a larger footprint (200m$^2$ compared to 150m$^2$).

6.6.6. Two VERs (H and I) have been assigned to cover the intertidal biotopes which have been defined as having very low and low ecological sensitivity respectively to physical disturbance, as may occur during landfall works.

6.6.7. The magnitude of effect is assessed as low (3200m$^2$ which represents 0.35% of the overall intertidal habitats within the landfall study area. Therefore, a **negligible** impact on intertidal habitats is predicted.as a result of proposed landfall works for either Dogger Bank Teesside A or Dogger Bank Teesside B built in isolation.

 

### Dogger Bank Teesside A and Dogger Bank Teesside B together

6.6.8. For the development of Dogger Bank Teesside A & B together, the scenario is the same above, but with a larger area of effect due to a need for either four small cofferdams or two large cofferdams and up to a 20m wide open-cut trench for cables (x300m beach length).

6.6.9. However, the same conclusions with respect to the sensitivity of the intertidal VERs and magnitude of effect apply, and a **negligible** impact is predicted.

## 6.7. Potential construction phase impacts on the Dogger Bank cSAC

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

6.7.1. As outlined in Section 4.4**,** all of Dogger Bank Teesside A & B and part of the Dogger Bank Teesside A & B Export Cable Corridor lie within the boundary of the Dogger Bank cSAC. Although many of the seabed habitats within these areas may not conform exactly to the main habitat interest feature of the cSAC, namely "*subtidal sandbanks which are slightly covered by seawater at all times"* from an ecological perspective, all the habitats present form a key part of this overall sandbank feature.

6.7.2. Impacts on these habitats via temporary habitat disturbance and increased suspended sediments and deposition have been assessed in preceding sections. Therefore, this specific impact assessment aims to describe and quantify these potential construction phase impacts in the context of the Dogger Bank cSAC.

6.7.3. No assessment is presented with regard the favourable conservation status of the Dogger Bank cSAC or the achievement of conservation objectives of either the entire cSAC, or its qualifying features as this is the remit of the HRA which is separate to the main EIA process. The magnitude of potential effect relative to the Dogger Bank cSAC is presented but this is primarily to assist the HRA process.

6.7.4. An important point to note with respect to assessment of impacts on the Dogger Bank cSAC and the key seabed habitats, for which it has been designated, is that the overall approach to EIA for marine and intertidal ecology already factors in the importance of these habitats (as qualifying features of a cSAC) in the overall impact assessment methodology. This is reflected in **Tables 3.2**, **3.3** and **3.4** which illustrate that the overall sensitivity of the receptor, against which magnitude of effect is combined to produce overall significance, is defined via a combination of not only ecological sensitivity but the importance/value of the receptor from a conservation perspective.

6.7.5. By adopting this approach, an assessment of potential impacts on the cSAC habitats is intrinsic to the overall assessment and is the reason why different VER groups were assigned for this assessment, VERs A, B and C are the same habitats as VERs D, E and F but the former are defined as having greater (EIA) sensitivity as these habitats lie within the boundaries of the Dogger Bank cSAC.

 

6.7.6. Therefore, the following assessment should be read in conjunction with the **HRA Report** for Dogger Bank Teesside A & B.

6.7.7. The previous impact assessments have focussed on VERs within the wind farm and Dogger Bank Teesside A & B Export Cable Corridor, in terms of the amount of these habitats affected as a proportion (%) of the overall habitats in the site/corridor and the overall ecological sensitivity of the habitats. For this impact, the footprint of effects is defined in the context of the Dogger Bank cSAC site boundary, as defined in the latest SAC Selection Assessment Document (JNCC, Version 9.0, August 2011).

6.7.8. Based on the SAC Selection Assessment Document (JNCC, Version 9.0, August 2011), the overall area of the Dogger Bank cSAC is 12,331km$^2$. A summary of the areas (km$^2$) of Dogger Bank Teesside A and Dogger Bank Teesside B that lie within the boundaries of the cSAC are provided below in **Tables 6.2** and **6.3**, with the predicted footprint of construction phase effects as identified in preceding impact statements, presented as a proportion of the cSAC in **Table 6.4**.

Table 6.2 Dogger Bank Teesside A as a proportion of the Dogger Bank cSAC

| **Area** | **Value** |
|---|---|
| Area of cSAC | 12,331km$^2$ |
| Area of Dogger Bank Teesside A wind farm within cSAC boundary | 560.110km$^2$ |
| Area of Dogger Bank Teesside A Export Cable Corridor in cSAC boundary * | (a) 4.87 + (b) 153.45 = 158.32km$^2$ |
| Total area of Dogger Bank Teesside A (wind farm and Dogger Bank Teesside A & B Export Cable Corridor) within cSAC boundary | 718.43km$^2$ |
| Total area of Dogger Bank Teesside A (wind farm and Dogger Bank Teesside A & B Export Cable Corridor) within cSAC as % of overall cSAC | 5.82% |

* (a) area of Dogger Bank Teesside A Export Cable Corridor outside the Dogger Bank zone boundary; (b) area of Dogger Bank Teesside A Export Cable Corridor within Dogger Bank zone boundary.

 

### Table 6.3 Dogger Bank Teesside B as a proportion of the Dogger Bank cSAC

| Area | Value |
|---|---|
| Area of cSAC | 12,331km$^2$ |
| Area of Dogger Bank Teesside B wind farm within cSAC boundary | 593.810km$^2$ |
| Area of Dogger Bank Teesside B Export Cable Corridor in cSAC boundary * | (a) 4.87 + (b) 153.45 = 158.32km$^2$ |
| Total area of Dogger Bank Teesside B (wind farm and Dogger Bank Teesside A & B Export Cable Corridor) within cSAC boundary | 752.13km$^2$ |
| Total area of Dogger Bank Teesside B (wind farm and Dogger Bank Teesside A & B Export Cable Corridor) within cSAC as % of overall cSAC | 6.10% |

* (a) area of Dogger Bank Teesside B Export Cable Corridor outside the Dogger Bank zone boundary; (b) area of Dogger Bank Teesside B Export Cable Corridor within Dogger Bank zone boundary.

### Table 6.4 Dogger Bank Teesside A and/or B (and Dogger Bank Teesside A and B) combined construction phase effect footprints as a proportion of the Dogger Bank cSAC

| Area | Dogger Bank Teesside A | Dogger Bank Teesside B | TOTAL (Dogger Bank Teesside A and Dogger Bank Teesside B) |
|---|---|---|---|
| Area of cSAC (12,331km$^{2)}$ | N/A | N/A | N/A |
| Maximum footprint of construction phase effects (temporary disturbance) within Dogger Bank Teesside A/B wind farm(s) / cSAC | 15.81km$^2$ | 15.81km$^2$ | 31.62km$^2$ |
| Maximum footprint of construction phase effects (temporary disturbance) within Dogger Bank Teesside A/B Dogger Bank Teesside A & B Export Cable Corridor(s) * / cSAC | 2.48km$^2$ | 1.60km$^2$ | 4.08km$^2$ |
| Total footprint of construction phase effects (temporary disturbance) within Dogger Bank Teesside A/B wind farms(s) and Dogger Bank Teesside A & B Export Cable Corridor(s) * / cSAC | 18.29km$^2$ | 17.41km$^2$ | 35.70km$^2$ |
| Dogger Bank Teesside A/B construction phase effect footprint as % of overall cSAC | 0.15% | 0.14% | 0.29% |

* Only the footprint of effect within the parts of the Dogger Bank Teesside A & B Export Cable Corridor that lie within the cSAC boundary are listed here. Cable corridor "within SAC boundary" includes all of export cable within the main zone and the small section outside the main zone but still within the SAC boundary.

6.7.10. From **Tables 6.2** and **6.3**, it can be noted that the entire area of Dogger Bank Teesside A & B and relevant parts of their Dogger Bank Teesside A & B Export Cable Corridors lie within the Dogger Bank cSAC boundary. For Dogger Bank Teesside A, the total area of wind farm and Dogger Bank Teesside A & B Export Cable Corridor (including the in-zone cable corridor) that lies within the SAC boundary totals 718.43km$^2$ (5.82%) of the overall cSAC area). For Dogger Bank Teesside B, this figure is 752.13km$^2$ (6.10%).

6.7.11. In terms of actual footprint of construction phase effects via temporary disturbance (including jetting of cables), the overall footprint of effects that will affect habitats within the cSAC totals 18.29km$^2$ (0.15% of overall cSAC) for Dogger Bank Teesside A and 17.41km$^2$ (0.14% of overall cSAC for Teesside B ) – see **Table 6.4**.

6.7.12. Whilst noting the very small proportion of the overall cSAC that would be affected by temporary disturbance during construction of either Dogger Bank Teesside A or Dogger Bank Teesside B, it is also important to note that the majority of habitats that would be affected within the cSAC boundary also have a low sensitivity to temporary disturbance, with only **negligible** and **minor adverse** impacts predicted on these habitats via earlier impact assessments.

6.7.13. With respect to effects of suspended sediment concentration and sedimentation, the spatial extent of this effect footprint is greater than that for direct physical disturbance, but will still be a relatively small proportion of the overall cSAC area. As outlined in earlier impact assessments, the habitats present within the Dogger Bank cSAC (VERs A, B and C) also exhibit a low sensitivity to suspended sediment concentrations and sediment deposition.

## Dogger Bank Teesside A and Dogger Bank Teesside B together

6.7.14. **Table 6.4** indicates a total footprint of temporary disturbance from both Dogger Bank Teesside A and Dogger Bank Teesside B of 0.29% of the cSAC, representing a very small proportion of the overall habitats within the cSAC (which can be expected from the information available to be similar to those recorded in the study area). Therefore, the same conclusions made above in relation to Dogger Bank Teesside A or Dogger Bank Teesside B in isolation and the conservation objectives of the cSAC are predicted to remain valid for Dogger Bank Teesside A & B together.

6.7.15. As outlined above, an assessment of the potential for these impacts to affect the integrity of the cSAC, from a Habitats Regulations perspective, is contained in the **HRA Report**. The **HRA Report** provides sufficient information to enable a competent authority to undertake an Appropriate Assessment of the proposals should one be required.

6.7.16. The HRA process will formally consider any marine ecological impacts (and other impacts) against the structure and function and conservation objectives of the Dogger Bank cSAC (as well as other SAC/SPA sites) so that a determination of potential effects on the integrity of these sites can be undertaken.

 

# 6.8. Potential construction phase impacts on sites of marine conservation interest

## Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

6.8.1. The preceding impact assessments have discussed the potential for construction activities to produce effects that may impact benthic habitats in the Dogger Bank Teesside A & B study area. The benthic habitats have been grouped into VERs as per the approach set out in Section 3.3, with these VERs representing the receptors against which impacts have been assessed.

6.8.2. This particular impact assessment discusses the effects on benthic habitats described previously in the context of the following sites of marine nature conservation interest, for which examples occur within and around the Dogger Bank Teesside A & B study area;

- UK BAP Habitats;
- rMCZs; and
- OSPAR habitats and species.

6.8.3. It is important to note that potential impacts on the ecological elements of the sites of marine conservation interest listed above have already been assessed via the individual impact assessments presented up to this point. Therefore, to avoid repetition in the assessment process, the assessment of potential construction phase impacts on sites of marine conservation interest are presented below as a series of summary tables which make reference to the conclusions of previous impact assessments.

6.8.4. It should also be recognised that the preceding impact assessments have all been undertaken via an assessment of the sensitivity of receptors and the magnitude of effect. For the benthic receptors (VERs), the overall EIA sensitivity has been determined via a combination of ecological sensitivity of the receptor to a particular effect, as well as the value of the receptor, for example, whether or not it represents Annex I habitat. The value element of receptor sensitivity (see **Table 3.2**) already takes account of whether or not a habitat or species may be of conservation interest, which is therefore inherent within the assessment methodology.

6.8.5. The “receptor” heading in the following tables refers to the habitat/species of marine conservation interest (BAP Habitats in **Table 6.5** and rMCZs in **Table 6.6**) with the column headed “relevant VERs” identifying the VERs (as defined in **Table 4.4**) that apply to those habitats/species. The impact descriptions are those assessed previously via individual impact assessments, with any relevant mitigation and the residual impact from these previous impact assessments also presented.

 

### Table 6.5 Potential construction phase impacts on BAP habitats

| Receptor | Relevant VERs (see Table 4.4) | Impact description | Mitigation | Residual impact |
|---|---|---|---|---|
| "Subtidal sands and gravels" BAP Habitat<br><br>**and**<br><br>"Mud habitats in deep water" BAP Habitat | A, B, C, D, E and F | Physical disturbance to habitats and species, and temporary habitat loss | None | **Negligible** (VERs A, B, D, E, F)<br><br>**Minor adverse** (VER C) |
| | | Increased suspended sediment concentration and sediment deposition | None | **Negligible** (All relevant VERs) |
| | | Release of sediment contaminants resulting in potential effects on benthic ecology | None | **Negligible** (VERs A, B and C in main site)<br><br>**Minor adverse** (VERs A, B, C, D, E & F in cable corridor) |
| | | Increased suspended sediment concentration leading to impacts on plankton and primary productivity | None | **Negligible** (all relevant VERs) |
| | | Physical disturbance to intertidal habitats and species during landfall works * | N/A * | N/A * |

* This impact (intertidal) not relevant to the two subtidal and deep water BAP habitats relevant to the study area. Therefore, no residual impact listed.

6.8.6. Based on the previous impact assessments conducted on the benthic receptors (VERs) that are also representative of these two BAP habitats, it is concluded that, overall, there will be a **negligible** impact on some of the benthic habitats that are component parts of the two marine BAP habitats within the Dogger Bank Teesside A & B study area, with **minor adverse** impacts on other habitats (**Table 6.5**).

6.8.7. With respect to MCZs, on 21st November 2013, Defra announced the designation of 27 MCZ's from the initial long-list of 127 rMCZs. The two rMCZ's that exist in the Dogger Bank Teesside A & B study area (Compass Rose rMCZ) and Runswick Bay rMCZ), that have the potential to be impacted by construction activities, were not designated as MCZs but remain as rMCZs.

6.8.8. The Compass Rose rMCZ is located approximately 8km to the south of the Dogger Bank Teesside A & B Export Cable Corridor whilst the Runswick Bay rMCZ is 0.5km to the south of the cable corridor near landfall.

6.8.9. Compass Bay rMCZ has been recommended due to the presence of the broad scale habitat "moderate energy circalittoral rock. Based on the distribution of habitats within the Dogger Bank Teesside A & B Export Cable Corridor, similar rock-based biotopes also occur within the cable corridor (represented by VER G).

6.8.10. The detailed assessment of construction phase impacts on benthic habitats has concluded that **negligible** to **minor adverse** impacts will arise on these receptors during construction. The Compass Rose rMCZ does not overlap spatially with the Dogger Bank Teesside A & B Export Cable Corridor, therefore, scope for direct impacts via construction does not exist. However, scope does exist for potential indirect impacts via increased suspended sediments and deposition which may adversely affect habitats within this rMCZ. Any such impacts on habitats in this rMCZ will be no more significant than the impacts already assessed on habitats within the cable corridor. Therefore, it is concluded that there will be, at worst, **minor adverse** impacts on habitats within the Compass Rose rMCZ via construction activities associated with the Dogger Bank Teesside A & B Export Cable Corridor.

6.8.11. With respect to Runswick Bay, this rMCZ is recommended due to the presence of subtidal sedimentary environments and circalittoral and infralittoral rock habitats. As per Compass Bay rMCZ, the lack of spatial overlap between this rMCZ and the Dogger Bank Teesside A & B Export Cable Corridor means that direct impacts will not arise. The scope for indirect impacts (via increased suspended sediment and deposition) is greater than for Compass Rose rMCZ due to closer proximity of Runswick Bay to the cable corridor. However, it is concluded that the significance of impact son habitats within Runswick Bay rMCZ will be no greater than those already assessed on habitats within the Dogger Bank Teesside A & B Export Cable Corridor.

6.8.12. Therefore, it is concluded that there will be, at worst, **minor adverse** impacts on habitats within the Runswick Bay rMCZ via construction activities associated with the Dogger Bank Teesside A & B Export Cable Corridor.

Table 6.6 Potential construction phase impacts on rMCZs

| Receptor | Relevant VERs (see Table 4.4) | Impact description | Mitigation | Residual impact |
|---|---|---|---|---|
| Compass Rose rMCZ | G | Physical disturbance to habitats and species and temporary habitat loss | None | **Negligible** |
| | | Increased suspended sediment concentration and sediment deposition | None | **Negligible** |
| | | Release of sediment contaminants resulting in potential effects on benthic ecology | None | **Minor adverse** |
| | | Increased suspended sediment concentration leading to impacts on plankton and primary productivity | None | **Negligible** |
| | | Physical disturbance to intertidal habitats and species during landfall works * | None | N/A * |
| Runswick Bay rMCZ | D, E, G | As above | As above | As above |

* This impact (intertidal) not relevant to Compass Rose rMCZ or Runswick Bay rMCZ as neither rMCZ is designated for intertidal habitats.

6.8.13. With respect to potential impacts on OSPAR threatened species and habitats, no such species or habitats are recorded within the Dogger Bank Teesside A & B study area, therefore, no impacts are predicted.

 

### Dogger Bank Teesside A and Dogger Bank Teesside B together

6.8.14. The previous VER based impact assessments concluded that even if Dogger Bank Teesside A & B were constructed together, there would be no change in the level of any of the impacts predicted via either project being constructed in isolation. Therefore, the conclusions with respect to potential impacts on BAP habitats and rMCZs presented above are also relevant to this scenario.

## 6.9. Monitoring of construction phase impacts

6.9.1. Although no significant adverse impacts are predicted on marine and intertidal ecology from the construction phase of the project, it is proposed that monitoring of benthic communities is undertaken to confirm these predictions.

6.9.2. The objectives and design of benthic monitoring programmes for offshore wind farm developments are well established and it is expected that the elements of the benthic monitoring programme for Dogger Bank Teesside A & B will be similar to other programmes on existing offshore wind farms.

6.9.3. A pre-construction survey will be carried out no more than 12 months prior to the start of offshore construction. The data from this survey will represent the formal baseline against which future changes will be monitored via post-construction surveys in the operational phase. The exact time-frame/frequency of post-construction monitoring will be decided via consultation with key regulatory bodies but it is noted that under (deemed) Marine Licences it is possible to carry out monitoring over the lifetime of the project. Therefore, it is expected that post-construction monitoring of marine ecological habitats will be conducted at more infrequent intervals throughout the lifetime of the development (in contrast to previous FEPA requirements for surveys in years one to three post-construction only).

6.9.4. It is proposed that sampling stations will include several locations within the main wind farm site(s), several locations outside of the wind farm(s), but within the near-field and several locations that are outside of the area of influence of the wind farm(s) to act as controls. The selection of sampling locations will also take account of the outputs of the physical process modelling work undertaken as part of the EIA.

6.9.5. Each sampling location will include a minimum of three grab-sampling (mini-hamon grab) replicates for infaunal invertebrate analysis with sub-sampling of one of these samples for particle size analysis. Grab sampling will be preceded by a drop down video survey to record epibenthic flora and fauna and to ensure that the grab is not deployed over sensitive benthic habitats.

6.9.6. The pre-construction marine ecology survey will include an Annex I habitat survey that will be designed such that the potential presence and spatial distribution of potential Annex I reef habitat (specifically cobble reef habitat in relation to Dogger Bank Teesside A & B) is fully determined prior to construction commencing. The design of this survey will be based upon guidance presented in the ALSF Report “Best methods for identifying and evaluating *Sabellaria spinulosa* and cobble reef” (Limpenny *et a.l* 2010).

 

6.9.7. The final objectives, design and methodology of both the wider benthic habitat survey and the focussed Annex I habitat survey will be issued to statutory bodies for review and sign-off prior to the survey commencing.

 

# 7. Assessment of Impacts during Operation

## 7.1. Permanent loss of habitat via placement of project infrastructure (foundations, cable protection, scour protection)

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.1.1. Long-term habitat loss will occur directly under all foundation structures and associated scour protection, and also under all inter-array and export cables where secondary cable protection is required for the lifetime of the project. The MarLIN factor relevant to this impact, and, therefore, used to inform this assessment is "substratum loss.

7.1.2. Based on the worst-case scenario of 200 x GBS foundations, along with all other related project infrastructure (see **Table 5.1**), a total permanent habitat loss of 6.40km$^2$ is predicted for Dogger Bank Teesside A, of which 3.73km$^2$ will occur within the wind farm boundaries (foundations, array cable protection, scour protection and vessel mooring) and the remaining 2.67km$^2$ will occur within the Dogger Bank Teesside A & B Export Cable Corridor (via cable protection and cable crossings).

7.1.3. For Dogger Bank Teesside B, the same permanent habitat loss figure of 3.73km$^2$ applies for the wind farm) with the permanent habitat loss within the Dogger Bank Teesside A & B Export Cable Corridor being less (2.40km$^2$) due to the shorter length of the Dogger Bank Teesside A & B Export Cable Corridor (therefore, less cable protection needed)

7.1.4. Using the same approach as outlined in Section 6, of the overall footprint of impact being allocated on a percentage basis in line with the percentage coverage of the study area by the VERs, the permanent habitat losses within the wind farm and Dogger Bank Teesside A & B Export Cable Corridor are expressed as percentage of the total VERs below in **Table 7.1**.

7.1.5. In terms of the three VERs identified within the wind farm of Dogger Bank Teesside A, it is predicted that 0.35km$^2$ of VER A would be lost along with 0.19km$^2$ and 3.20km$^2$ of VERs B and C respectively, representing a total of 3.73km$^2$ of habitat loss (0.66% of the entire site).

7.1.6. For Dogger Bank Teesside B, 2.26km$^2$ of VER A would be lost along with 0.21km$^2$ and 1.26km$^2$ of VERs B and C respectively. This total of 3.73km$^2$ represents (0.63% of the entire Dogger Bank Teesside B site).

7.1.7. In terms of sensitivity of these VERs to this effect (substratum loss), VERs A, B and C are all judged to have a moderate (ecological) sensitivity to this effect, based on the most sensitive biotope within each VER to this specific effect. Therefore, an overall (EIA) sensitivity of medium (see **Table 3.3**) is assigned to these three VERs as they are internationally important receptors (Annex I habitats in a cSAC boundary) but with medium vulnerability and recoverability.

7.1.8. The magnitude of this effect is judged to be low as the spatial extent of this effect is less than 5% of the main wind farm site(s) and there will be a slight change in baseline conditions due to the introduction of hard substrate (see separate impact assessment related to this below). Therefore, the combination of medium sensitivity and low magnitude results in a prediction of a **minor adverse** impact on existing benthic habitats (VER's A, B and C) within the main Dogger Bank Teesside A or Dogger Bank Teesside B site boundaries due to permanent habitat loss.

7.1.9. With respect to the Dogger Bank Teesside A & B Export Cable Corridor, permanent habitat loss will arise through the placement of export cable protection and material for cable crossings. For Dogger Bank Teesside A this has been calculated as totalling 2.67km$^2$, which represents 1.14% of the Dogger Bank Teesside A & B Export Cable Corridor (233.36km$^2$). For Dogger Bank Teesside B, 2.40km$^2$, representing 1.02% of the Dogger Bank Teesside A & B Export Cable Corridor would be lost. As for the wind farm, the distribution of this habitat loss across the nine VERs that occur within the Dogger Bank Teesside A & B Export Cable Corridor will vary, depending on the final cable route but for the purpose of this assessment, it has been assumed that the impact will be spread across all VERs in the same proportion as they appear in the corridor (see **Table 7.1**).

7.1.10. VERs A, B and C also occur within the Dogger Bank Teesside A & B Export Cable Corridor, as part of the export cable lies within the zone and the boundary of the SAC also overlaps with the export cable at the most eastern section. As per the assessment for the wind farm, the (EIA) sensitivity of these three VERs within the Dogger Bank Teesside A & B Export Cable Corridor is assessed as medium, which with a low magnitude of effect (due to the small amount of permanent habitat loss and lack of impact on the SAC interest features), results in a **minor adverse** impact on these VERs within the Dogger Bank Teesside A & B Export Cable Corridor.

7.1.11. Although it is recognised that VER's D to H have a moderate (ecological) sensitivity to this effect (substratum loss), based on the criteria in **Table 3.3**, these VER's are judged to have a low (EIA) sensitivity as they represent locally important receptors. When combined with a low magnitude of effect a **negligible** impact is predicted via permanent habitat loss on VER's D to H within the Dogger Bank Teesside A & B Export Cable Corridor.

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## Table 7.1 Proportion of VER habitats affected by permanent habitat loss during the operational phase

| | Dogger Bank Teesside A | | | Dogger Bank Teesside B | | | Dogger Bank Teesside A and B combined | | |
|---|---|---|---|---|---|---|---|---|---|
| VER * | Total area ($km^2$) of VER within wind farm | % of area covered by VER within wind farm | Area ($km^2$) of VER potentially affected | Total area ($km^2$) of VER within wind farm | % of area covered by VER within wind farm | Area ($km^2$) of VER potentially affected | Total area ($km^2$) of VER within wind farm | % of area covered by VER within wind farm | Area ($km^2$) of VER potentially affected |
| **Wind Farm sites** | | | | | | | | | |
| **A** | 51.9$km^2$ | 9.27% | 0.35$km^2$ | 359.04$km^2$ | 60.52% | 2.26$km^2$ | 410.94$km^2$ | 35.63% | 2.66$km^2$ |
| **B** | 28.06$km^2$ | 5.01% | 0.19$km^2$ | 33.74$km^2$ | 5.69% | 0.21$km^2$ | 61.8 $km^2$ | 5.36% | 0.40$km^2$ |
| **C** | 480.15$km^2$ | 85.72% | 3.20$km^2$ | 200.43$km^2$ | 33.79% | 1.26$km^2$ | 680.58$km^2$ | 59.01% | 4.40$km^2$ |
| **TOTAL** | **560.11$km^2$** | **100.00%** | **3.73$km^2$** | **593.21$km^2$** | **100.00%** | **3.73$km^2$** | **1153.32$km^2$** | **100%** | **7.46$km^2$** |
| **Dogger Bank Teesside A & B Export Cable Corridor (including in-zone cables)** | | | | | | | | | |
| **A** | 126.62$km^2$ | 54.26% | 1.45$km^2$ | 126.80$km^2$ | 54.09% | 1.30$km^2$ | 253.42$km^2$ | 54.18% | 2.75$km^2$ |
| **B** | 12.05$km^2$ | 5.16% | 0.14$km^2$ | 11.66$km^2$ | 4.98% | 0.12$km^2$ | 23.71$km^2$ | 5.07% | 0.26$km^2$ |
| **C** | 19.98$km^2$ | 8.56% | 0.23$km^2$ | 20.03$km^2$ | 8.55% | 0.21$km^2$ | 40.01$km^2$ | 8.55% | 0.43$km^2$ |
| **D** | 6.80$km^2$ | 2.91% | 0.08$km^2$ | 6.32$km^2$ | 2.70% | 0.06$km^2$ | 13.12$km^2$ | 2.80% | 0.14$km^2$ |
| **E** | 18.66$km^2$ | 7.98% | 0.21$km^2$ | 16.55$km^2$ | 7.06% | 0.17$km^2$ | 35.21$km^2$ | 7.53% | 0.38$km^2$ |
| **F** | 48.73$km^2$ | 20.88% | 0.56$km^2$ | 52.51$km^2$ | 22.40% | 0.54$km^2$ | 101.24$km^2$ | 21.64% | 1.10$km^2$ |
| **G** | 0.07$km^2$ | 0.03% | 0.00$km^2$ | 0.07$km^2$ | 0.03% | 0.00$km^2$ | 0.15$km^2$ | 0.03% | 0.00$km^2$ |
| **H** | 0.40$km^2$ | 0.17% | 0.00$km^2$ | 0.40$km^2$ | 0.17% | 0.00$km^2$ | 0.80$km^2$ | 0.17% | 0.01$km^2$ |
| **I** | 0.05$km^2$ | 0.02% | 0.00$km^2$ | 0.05$km^2$ | 0.02% | 0.00$km^2$ | 0.10$km^2$ | 0.02% | 0.00$km^2$ |
| **TOTAL** | **233.36$km^2$** | **100.00%** | **2.67$km^2$ *** | **234.40$km^2$** | **100.00%** | **2.40$km^2$** | **467.76$km^2$** | **100.00%** | **5.07$km^2$** |

*
**VER A:** Sandy sediment supporting relatively low diversity benthic communities which form part of the Annex I Sandbank Feature (within boundary of cSAC)
**VER B**: Coarse sediments with medium to high diversity benthic communities which form part of the Annex I Sandbank Feature (within boundary of cSAC)
**VER C**: Muddy sand sediments with medium diversity benthic communities (including sea pens)  which form part of the Annex I Sandbank Feature (within boundary of cSAC)
**VER D**: Sandy sediment supporting relatively low diversity benthic communities outside cSAC boundary)
**VER E**: Coarse sediments with medium to high diversity benthic communities outside cSAC boundary
**VER F:** Muddy sediments with medium diversity benthic communities (including sea pens) outside cSAC boundary
**VER G**: Rock-based infralittoral and circalittoral habitats
**VER H:** Intertidal sand-based habitats
**VER I:** Intertidal rock-based habitats

## Dogger Bank Teesside A and Dogger Bank Teesside B together

7.1.12. The combined permanent habitat loss across Dogger Bank Teesside A & B if both projects are built is shown in **Table 7.1**. Loss of 7.46km$^2$ of the total wind farm area of 1153.920 km$^2$ represents 0.64% of the overall habitat in the two sites combined.

7.1.13. In terms of overall impact, as per the assessment of each project in isolation, the (EIA) sensitivity of VERs A, B and C (both within the wind farm and in the offshore section of the Dogger Bank Teesside A & B Dogger Bank Teesside A & B Export Cable Corridor that overlaps with the SAC boundary) to this effect is judged to be medium. The magnitude of effect is judged to be low, based on the fact that only 0.64% of habitats represented by VER A, B and C in the wind farms will be affected.

7.1.14. Therefore, a prediction of **minor adverse** impact on existing benthic habitats within the wind farm boundary due to permanent habitat loss is concluded via Dogger Bank Teesside A and Dogger Bank Teesside B together.

7.1.15. With respect to the combined Dogger Bank Teesside A & B Export Cable Corridors, loss of 5.07km$^2$ from a total area of 467.76km$^2$ represents a loss of 1.08% of overall habitats within the cable corridor. Therefore, a low magnitude effect is predicted.

7.1.16. VER's A, B and C exist in the cable corridor and are assigned a medium sensitivity to this effect. Coupled with a low magnitude of effect, a **minor adverse** impact on VERs A, B and C which lie within the Dogger Bank Teesside A & B Export Cable Corridor is predicted via permanent habitat loss.

7.1.17. For VERs D to I the sensitivity of these receptors to the effect of permanent habitat loss is defined as low based on the criteria in **Table 3.3**. When combined with a low magnitude of effect a **negligible** impact is predicted.

# 7.2. Temporary impact on benthos due to physical disturbance caused by maintenance activities

## Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.2.1. During the operation of the wind farm, there will be the need for regular and unplanned maintenance from jack up vessels and other heavy offshore equipment. This will cause localised disturbance to benthic habitats within the site.

7.2.2. The MarLIN factor relevant to this impact, and, therefore, used to inform this assessment is "physical disturbance and abrasion".

7.2.3. Based on sensitivity assessments provided by MarLIN for component biotopes of the three VERs that have been identified within Dogger Bank Teesside A and Dogger Bank Teesside B, the ecological sensitivity of the VER's to physical disturbance and abrasion (as would be temporarily produced via jacking-up activities in the operational phase) varies from low (VER A and B) to moderate (VER C). In terms of predicting the impact, although the value of VERs A, B and C are defined as International (see **Table 3.2**), the actual sensitivity of these VERs in EIA terms (as defined in **Table 3.3**), varies due to the different vulnerability and recoverability to this effect (physical disturbance) of these three VERs.

7.2.4. Therefore, for VERs A and B, a sensitivity of low is assigned due to the high recoverability of these habitats to physical disturbance and abrasion, whilst for VER C, a sensitivity of medium is assigned due to the greater vulnerability and longer recovery time of these habitats to physical disturbance.

7.2.5. Based on information provided in **Chapter 5**, a worst-case scenario for maintenance activities in relation to benthic impacts has been provided. This predicts a maximum footprint for temporary habitat disturbance due to jacking-up activities during the operational phase of a project of 0.904km$^2$ which equates to 0.161% of the overall area (wind farm) of Dogger Bank Teesside A. For Dogger Bank Teesside B the same area is impacted (0.904km$^2$) equating to 0.152% of the overall area (wind farm).

7.2.6. The magnitude of effect is judged to be low due to limited spatial extent of any jacking-up activities and the intermittent nature of this effect.

7.2.7. Therefore, for VERs A and B, their low sensitivity to this effect combined with a low magnitude of effect is predicted to result in a **negligible** impact. For VER C, the increased sensitivity of this VER (medium - based on the moderate ecological sensitivity of certain biotopes in this VER to this effect) results in a **minor adverse** impact via maintenance activities (jacking-up) in the operational phase.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.2.8. With both projects in operation, the potential for temporary disturbance to benthic habitats would be greater than for one project in isolation. Based on the worst-case scenarios identified via the project description, the amount of habitat that could be affected across both projects via temporary habitat disturbance in the operational phase (via jacking-up) amounts to 1.808km$^2$, which represents 0.156% of the total 1153.920km$^2$ area of the Dogger Bank Teesside A and Dogger Bank Teesside B sites (excluding the Dogger Bank Teesside A & B Export Cable Corridor) combined.

7.2.9. The sensitivity of VERs A, B and C will be as defined above and the magnitude of effect is judged to remain low due to the small spatial extent in comparison to the overall wind farm area. Therefore, a **negligible** impact is predicted on VERs A and B, with a **minor adverse** impact on VER C due to vessel interactions with the seabed (jacking-up) during the operational phase of these projects.

## 7.3. Change in hydrodynamics and inter-related effects on benthos

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.3.1. During the operational phase of the project, the presence of physical structures within the site, including foundations, scour protection and vessel moorings, has the potential to change existing hydrodynamic conditions (wave and tidal currents) within the site.

7.3.2. The existing benthic communities are distributed mainly according to sediment type, which is itself linked to over-arching hydrodynamic processes so any change in the latter could result in eventual changes to benthic communities.

7.3.3. The MarLIN factors relevant to this impact, and, therefore, used to inform this assessment are “increase/decrease in wave exposure” and “increase/decrease in water flow rate”.

7.3.4. The worst-case scenario for modelling hydrodynamic changes in the operational phases was considered to be a grid of foundations that filled each project area (Dogger Bank Teesside A & B) with 200 x 6MW turbines with GBS#1 foundations (400 in total), with a minimum spacing of turbines (750m) around the perimeter and a wider internal spacing. This provides the maximum potential for interaction of tidal current and wave processes between foundations.

7.3.5. Based on this worst-case scenario, a maximum change in tidal current velocity of less than 2% along narrow (up to 3km wide) bands restricted to the project boundaries is predicted to occur.

7.3.6. This maximum percentage change is within the natural variation of tidal current velocity across Dogger Bank and surrounding sea areas and is so small that it is unlikely to affect the form of recent sediments over and above the natural tidal processes.

7.3.7. With respect to changes in wave regime, based on the same worst-case scenario as per tidal currents, a maximum increase in significant wave height of 1% along the south/southwest perimeter of Dogger Bank Teesside B (in a band about 12km wide) and the north perimeter of Dogger Bank Teesside A is predicted. As per tidal currents, these predicted changes in wave regime are within the natural variation of wave heights across Dogger Bank and surrounding sea areas and are unlikely to affect the form of recent sediments over and above the natural wave regime.

7.3.8. In terms of the potential impacts of these changes on benthic communities, the sensitivity of the key habitats within the wind farms to changes in hydrodynamic processes needs to be understood.

7.3.9. Of the three VERs identified within the wind farm, VER A and C are judged to have a moderate (ecological) sensitivity to increased wave exposure and increased water flow (tidal currents), with VER B having a low (ecological) sensitivity to these effects. However, the benchmark increase in wave exposure required to trigger the moderate sensitivity to this factor is a change from existing conditions to `exposed’ and ‘very exposed’ categories. Such increases in wave exposure are not predicted to arise at Dogger Bank Teesside A & B during the operational phase, with a maximum increase in significant wave height of 1% predicted along the south/southwest perimeter of Dogger Bank Teesside B (in a band about 12km wide).

7.3.10. Similarly, the benchmark increase in water flow (tidal current) required to trigger these moderate sensitivities to this factor is a change of at least two classes from the existing “Weak” flow rate (<0.5m/s - typical tidal currents are less than 0.4m/s in the study area) to “Strong” (1.5 – 3m/s).

7.3.11. Such increases in tidal currents are not predicted to arise at Dogger Bank Teesside A & B during the operational phase, with the maximum change in current velocity predicted to be less than 2% along narrow (3km) bands restricted to the project boundaries.

7.3.12. Therefore, the overall (EIA) sensitivity of the VERs within the Dogger Bank Teesside A & B wind farm sites due to the changes in the hydrodynamic regime predicted to arise is negligible. The magnitude of this effect is also judged to be negligible as the changes in wave and tidal conditions during the operational phase are judged to be within natural limits of variation.

7.3.13. Overall, a **negligible** impact on all benthic receptors within the main wind farm sites and Dogger Bank Teesside A & B Export Cable Corridor is predicted via changes in the hydrodynamic regime caused by the presence of project infrastructure.

7.3.14. None of the component biotopes that comprise these groups are judged to have a high sensitivity to changes in tidal flows or wave regime. This low sensitivity, coupled with the low magnitude of effect, results in a prediction of **negligible** impact on benthic habitats within the wind farms, as a result of changes to hydrodynamic processes in the operational phase.

7.3.15. Changes in hydrodynamic processes due to the potential presence of export cable protection are judged to be negligible and, as such, any subsequent impacts on benthic communities in the Dogger Bank Teesside A & B Export Cable Corridor are also judged to be **negligible**.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.3.16. As outlined above, the physical process modelling undertaken as part of the EIA for Dogger Bank Teesside A & B is based on a worst-case layout of a grid of foundations that fills both Dogger Bank Teesside A and Dogger Bank Teesside B with a total of 400 x turbines. Therefore, the predicted effects described above with regard to Dogger Bank Teesside A or Dogger Bank Teesside B in isolation also apply to the scenario whereby Dogger Bank Teesside A & B are operated together.

7.3.17. Therefore, the results and predictions relevant to benthic ecology presented above also apply to both projects operating together and the impact is predicted to remain as **negligible**.

## 7.4. Increase in suspended sediment concentration due to scour associated with foundations

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.4.1. During the operational phase of the project, the presence of foundation structures for wind turbines and other project infrastructure (converter stations, accommodation platforms etc.) will lead to the formation of scour around these structures.

7.4.2. The material scoured from each foundation location will become liberated into the water column and lead to increased suspended sediment concentration (SSC). The worst case scenario for this effect is presented in **Table 5.1** and is based on two 30-day model runs after (i) end of year 1 operation (200 x turbine foundations subjected to a 1-in-1 year storm event) and (ii) end of year 2 operation (400 x turbine foundations subjected to a 1-in-50 year storm event). This modelling scenario is actually based on Dogger Bank Teesside A & B being constructed together (400 turbine foundations in total, 200 constructed each year; 100 in Dogger Bank Teesside A & B respectively). Therefore, the findings presented below with regard to benthic ecology represent the worst-case and any effects for Dogger Bank Teesside A or Dogger Bank Teesside B built in isolation will be less than those described in reality.

7.4.3. The outputs of the modelling work indicated a maximum increase in suspended sediment concentrations of >200mg/l. These concentrations occur as 20km long, 6km wide patches along the north and south perimeters of Dogger Bank Teesside A and also the southwest perimeter of Dogger Bank Teesside B. Maximum suspended sediment concentrations are >20mg/l across all of Dogger Bank Teesside A & B, gradually reducing with distance from the foundations until they are 2mg/l approximately 40-54km south of the projects boundaries and 20-37km north of the project boundaries.

7.4.4. With respect to average suspended sediment concentration in the bottom layer, the modelling work predicted a value of between 10mg/l to 50mg/l across both projects and for up to approximately 19km to their south. Average suspended sediment concentration reduces to 2mg/l up to approximately 36km south of the projects southern boundaries and up to 26km north of the Dogger Bank Teesside A northern boundary.

7.4.5. The 2mg/l (background level) is exceeded > 90% of the 30-day simulation period in two patches, one to the south of Dogger Bank Teesside B and one within and to the south of Dogger Bank Teesside A, up to 15km south of their southern boundaries. Exceedance is generally greater than 70% across both Dogger Bank Teesside A & B.

7.4.6. These maximum values are similar to those predicted for increased suspended sediment concentration during the construction phase, although the spatial extent of concentrations that exceed background levels (2mg/l) is greater for this effect that for construction effects (levels above background of 2mg/l occur up to 54km south of the boundaries of Dogger Bank Teesside A & B for this operational effect whereas during construction, levels above background (2mg/l) only occur up to 40km from the project boundary.

7.4.7. As discussed with respect to the impact assessment of increased suspended sediment concentration in the construction phase, of the three VERs identified in the wind farm sites (VERs A, B and C), VER A is judged to be not sensitive to increased suspended sediment concentrations whilst VER B and C are judged to have very low and low ecological sensitivities respectively.

7.4.8. VER C is judged to have a greater ecological sensitivity to increased suspended sediment than VERs A and B due to the presence of the SS.SSa.IMuSa.EcorEns biotope within this receptor group. However, based on the MarLIN sensitivity assessment for this biotope (Hill 2008), VER C still only has a low sensitivity to this effect (although it is noted that other biotopes within VER C have even less sensitivity to this effect.

7.4.9. In terms of actual impact, although the values of VER A, B and C are defined as International (see **Table 3.2**), the actual sensitivity of VER A is classed as negligible as this is not sensitive to this effect. VERs B and C are defined as a low sensitivity as the biotopes within these groups exhibit low vulnerability to increased suspended sediment concentration and high recoverability to any such effects.

7.4.10. In terms of the magnitude of the effect in question, based on the criteria in **Table 3.4**, this is judged to be low as the effects are not predicted to affect the conservation status of the site, although it is accepted that there will be some effect on these habitats.

7.4.11. Therefore, as per the impact assessment for increased suspended sediment concentrations in the construction phase, for the same effect via scour in the operational phase, the negligible sensitivity of VER A and low magnitude of effect results in a **negligible** impact. A **negligible** impact is also predicted for VER B due to the Low sensitivity and Low magnitude of effect. For VER C, a **minor adverse** impact is predicted as although the overall sensitivity and magnitude of effect is the same as per VER B, the slightly increased sensitivity of biotopes within VER C to this effect results in an increased significance of impact.

7.4.12. In terms of VERs D to I, these habitats are located away from the Dogger Bank Teesside A & B site boundaries along the Dogger Bank Teesside A & B Export Cable Corridor and are all judged to be either not sensitive, or have a low sensitivity to increased suspended sediment concentrations. In terms of the magnitude of the effect in question, based on the criteria in **Table 3.4**, this is judged to below for all of the VERs, resulting in a **negligible** impact on all of the VERs along the Dogger Bank Teesside A & B Export Cable Corridor via increased suspended sediment concentrations produced via scour during the operational phase.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.4.13. The outputs and impact assessment defined above for Dogger Bank Teesside A & B in isolation are based on a worst-case modelling scenario of Dogger Bank Teesside A & B being constructed/operated together (400 turbine foundations in total, 200 constructed each year; 100 in Dogger Bank Teesside A & B respectively). Therefore, the findings presented above with regard to benthic ecology can also be applied to the scenario whereby Dogger Bank Teesside A & B are operated together.

## 7.5. Increase in sediment deposition following increase in suspended sediment concentration due to scour associated with foundations

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.5.1. The increased suspended sediment concentration via scour that will occur in the operational phase, as detailed above, will result in a related increase in sediment deposition. Based on the same modelling scenarios as per suspended sediment concentration (after year one operational and after year two operational), the outputs of the modelling work indicated that within Dogger Bank Teesside A & B, maximum thicknesses over the 30-day simulation period of 5mm are predicted in discrete areas, with the majority of the Dogger Bank Teesside A & B areas subject to deposition of between 0.5 and 5mm. Thickness then reduces to less than 0.1mm approximately 16-30km from the southern boundaries of the sites and 13-35km from the northern boundaries.

7.5.2. With respect to average deposition, this is predicted to be between 0.5mm and 5mm in a 32km long, 14km wide area located between Dogger Bank Teesside A & B. Elsewhere, the average deposition is less than 0.5mm, reducing to less than 0.1mm approximately 23km southwest of Dogger Bank Teesside B and 19km north of Dogger Bank Teesside A.

7.5.3. In terms of persistency of deposited sediment, the model predicts that deposition depth will be <0.1mm (i.e. returning to baseline) by the end of the 30-day model period for all locations modelled. In reality, this removes the potential for any "additive" effect of sediment deposition in parts of the site and, therefore, the maximum depths outlined above represent the actual maximum values predicted to arise.

7.5.4. Based on these values and the behaviour of any deposited sediment over a 30-day model period, together with the sensitivity of VERs within the wind farms and Dogger Bank Teesside A & B Export Cable Corridor, a **negligible** impact is predicted via sediment deposition on benthic habitats during the operational phase of the project.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.5.5. The outputs and impact assessment defined above for Dogger Bank Teesside A & B in isolation are based on a worst-case modelling scenario of Dogger Bank Teesside A & B being constructed/operated together (400 turbine foundations in total, 200 constructed each year; 100 in Dogger Bank Teesside A & B respectively). Therefore, the findings presented above with regard to benthic ecology can also be applied to the scenario whereby Dogger Bank Teesside A & B are operated together.

## 7.6. Introduction of new habitat in the form of foundation structures, leading to potential colonisation

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.6.1. All project infrastructure that has a sub-surface element will represent a suitable surface for colonisation by marine fauna and flora, including species that may not currently be found within the existing environment. This is of particular note in sedimentary environments like Dogger Bank where current substrates for colonisation by encrusting epifauna are very limited.

7.6.2. Therefore, the presence of foundations for wind turbines, accommodation platforms etc. will represent new areas for such colonisation, with potential to change the nature of benthic communities in the study area.

7.6.3. Based on the worst-case scenario for this impact presented in **Table 5.1**, up to a total of 6.40km$^2$ of hard substrate will be introduced via installation of either

Dogger Bank Teesside A or Dogger Bank Teesside B in isolation, via the range of project infrastructure including foundations, vessel moorings, scour and cable protection etc.

7.6.4. Noting the presence of epifaunal species and colonising fauna within discrete parts of the site and Dogger Bank Teesside A & B Export Cable Corridor already (associated with coarser sediments), it is predicted that colonisation of any introduced hard substrates will occur. Although exact species assemblages are difficult to predict, it is likely that fairly common species will colonise these areas, including species of bryozoans, ascidians and bivalve molluscs.

7.6.5. Whether such a change represents an adverse or beneficial impact in terms of the wider benthic ecological status of the study area is difficult to determine. It is possible that the colonisation of hard substrates by certain flora and fauna will produce an additional food source for some marine species, including commercially exploited fish. When coupled with any potential “reef” effect of the foundation structures, this may represent a beneficial impact to certain fish and shellfish species (see **Chapter 13** for more discussion on this issue). However, in contrast, the introduction of hard substrate in an area currently characterised as a sedimentary environment may create habitat that could be colonised by alien marine species, such as the Pacific marine midge *Telmatogeton japonicus* and the Japanese skeleton shrimp *Caprella mutica*.

7.6.6. Although not currently listed as an alien species in the UK (Non-Native Species Secretariat (NNSS) 2010), an increase in a population of *T. japonicus* has been noted from on-going monitoring studies of the Danish Horns Rev offshore wind farm in the North Sea (Bioconsult 2006).

7.6.7. The issue of potential colonisation of hard substrate by alien species, and in effect these structures acting as “stepping-stones” for introduction of these species into UK coastal waters has been raised by consultees on other offshore wind farm projects but it is not possible to assign a clear impact to this potential issue. However in 2009 Cefas conducted a review of the state of the benthic ecology around round one wind farms (Cefas 2009), in this review no invasive or alien species were observed though monitoring was recommended throughout the life span of the wind farms.

7.6.8. As per previous impact assessments, it is important to link this effect with the most relevant MarLIN factor, which in this instance, is the “introduction of non-native species” factor. All the component biotopes of the seven VERs identified in the study area are judged to be either not sensitive to this effect/factor or there is insufficient evidence to base any sensitivity assessment. Therefore, it is concluded that, in the absence of any clear beneficial or adverse impact with respect to this issue, a **negligible** impact is predicted. However, this conclusion is not based on any firm, tangible evidence of the long-term impact (or lack of) of colonisation of hard substrates in predominantly sedimentary environments as will occur within this area.

7.6.9. Of potential note is a recent inspection by Envision of video footage from a dive survey of the Dogger Bank region (including a number of wrecks) undertaken by Dutch divers in summer 2011. The review by Envision showed that the species associated with the wrecks appeared to be typical of a North Sea rocky reef in a moderate to strong current. Dominant species were *Alcyonium digitatum, Metridium senile*, *Gadus morhua, Homarus gammarus, Cancer pagurus, Spirobranchus* sp. and various ascidians.

7.6.10. These communities differ from those occurring on the Dogger Bank itself (which are predominantly sediment-dwelling species), and those which characterise the cSAC.

7.6.11. Some of the species recorded during the expedition, such as the sea slug *Polycera faroensis*, the sea squirt, *Acidia mentula*, and the cowrie *Trivia* sp. were at the time thought to be newly recorded for the Dutch marine fauna. However, these are not unusual for the UK North Sea fauna. Subsequently, however, it has been discovered that not all of these are new for Holland. A scientific paper subsequently written up from the expedition noted that two sea slugs, *Polycera faroensis* and *Doto dunnei,* were newly recorded for the Dutch marine fauna (Gittenberger *et al*. 2011).

7.6.12. This brief review of this 2011 dive survey indicated that the fauna that are likely to colonise turbine subsea structures are those that already occur commonly in the region on comparable substrates.

7.6.13. Long-term monitoring during the period of operation will be the only means to provide evidence to ascertain how long-term presence of introduced substrate and its colonisers influences the surrounding sedimentary habitats (see Section 7.9).

7.6.14. It is also recognised that in addition to the potential colonisation of hard substrates (foundations) by invasive species, another potential pathway via which invasive species may reach the Dogger Bank site, and therefore, potentially colonise areas where they had not previously occurred, is via ballast water.

7.6.15. During the operational phase of the project, there will be regular, on-going movement of vessels to and from the site. Some of these vessels may look to discharge ballast water on site. In order to control this activity, the Environmental Management Plan for the operational phase of the Dogger Bank Teesside A & B project will make reference to the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM).

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.6.16. With Dogger Bank Teesside A & B operating together, the potential area of hard substrate available for colonisation would increase (12.53km$^2$) due to the larger number of foundations and associated structures. However, the same conclusions and the difficulty in predicting whether this represents a beneficial or adverse impact remains (as outlined above), therefore the impact is predicted to remain as **negligible**.

## 7.7. Effect of electromagnetic fields on benthic communities

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.7.1. The Dogger Bank Teesside Scoping Report (Forewind 2012) proposed to scope out potential effects of electromagnetic fields (EMF) on benthic communities due to lack of data to inform any such assessment. However, the JNCC/Natural England response to the Scoping Report requested that this potential issue be assessed due to the fact that there is a lack of clear evidence indicating no impact on the benthos from EMF.

7.7.2. EMF is both the electric fields, measured in volts per metre (V/m) and the magnetic fields, measured in tesla (T). Therefore, when discussing EMF in the context of potential effects on marine organisms, in this case, benthic and epibenthic communities, it is the magnetic field and the resultant induced electric field that need to be considered (Normandeau *et al*., 2011).

7.7.3. For either Dogger Bank Teesside A or Dogger Bank Teesside B in isolation, a total of 1270km of array/inter-platform/inter/project cables plus up to 573km of export cables may be installed, of which the export cables will transmit HVDC with the array cables being High Voltage Alternating Current (HVAC) – see **Chapter 5**. Average magnetic fields of DC cables are higher than those of equivalent AC cables with the strength of the magnetic field (and consequently, induced electrical fields) decreasing rapidly horizontally and vertically with distance from source, in the order of 10m each side of the cable (assuming 1m burial) (Normandeau *et al*., 2011).

7.7.4. In terms of magnitude of effect, current literature suggests that EMF influenced behavioural and physiological effects in benthic invertebrates, if any are observed, will be closely related to the proximity of the individual to the source. EMF are strongly attenuated, therefore, any effects will be highly localised. Based on criteria in **Table 3.4**, a negligible magnitude of effect is predicted.

7.7.5. With respect to sensitivity of benthic and epibenthic receptors to this effect, there is very limited experimental data that demonstrates a clear adverse response to EMF by these species groups. Whilst some studies have demonstrated physiological responses to EMF in invertebrates, these have been at higher intensity fields much greater than would be recorded within on offshore wind farm (Normandeau *et al*., 2011).

7.7.6. Based on **Table 3.3**, the sensitivity of all the benthic VER's present within the Dogger Bank Teesside A & B and Dogger Bank Teesside A & B Export Cable Corridor is judged to be low, which combined with the negligible magnitude of effect results in a **negligible** impact on benthic receptors due to EMF in the operational phase.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.7.7. The same conclusions as presented above for Dogger Bank Teesside A or Dogger Bank Teesside B in isolation will apply for both projects built together. Even though the overall length of array and export cables will almost double for both projects together, and therefore, more benthic receptors will be exposed to EMF, a **negligible** impact is still predicted.

## 7.8. Potential operational phase impacts on the Dogger Bank cSAC

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.8.1. As outlined in Section 4.4**,** all of Dogger Bank Teesside A & B and part of the Dogger Bank Teesside A & B Export Cable Corridor lie within the boundary of the Dogger Bank cSAC. Although many of the seabed habitats within these areas may not conform exactly to the main habitat interest feature of the cSAC, namely "*subtidal sandbanks which are slightly covered by seawater at all times"* from an ecological perspective, all the habitats present form a key part of this overall sandbank feature.

7.8.2. Potential operational Impacts on these habitats via permanent habitat loss and increased suspended sediment and deposition generated via scour have been assessed in preceding sections. Therefore, this specific impact assessment aims to describe and quantify these potential operational phase impacts in the context of the Dogger Bank cSAC.

7.8.3. As per the approach for construction phase impacts, no assessment is presented with regard the favourable conservation status of the Dogger Bank cSAC or the achievement of conservation objectives of either the entire cSAC or its qualifying features as this is the remit of the HRA which is separate to the main EIA process. The magnitude of potential effect relative to the Dogger Bank cSAC is presented but this is primarily to assist the HRA process.

7.8.4. Therefore, the following assessment should be read in conjunction with the **HRA Report** for Dogger Bank Teesside A & B.

7.8.5. The previous operational phase impact assessments have focussed on VERs within the wind farms and Dogger Bank Teesside A & B Export Cable Corridor, in terms of the amount of these habitats affected as a proportion (%) of the overall habitats in the site/corridor and the overall ecological sensitivity of the habitats. For this impact, the footprint of effects is defined in the context of the Dogger Bank cSAC site boundary, as defined in the latest SAC Selection Assessment Document (JNCC, Version 9.0, August 2011).

7.8.6. Based on the SAC Selection Assessment Document (JNCC, Version 9.0, August 2011), the overall area of the Dogger Bank cSAC is 12,331km$^2$. A summary of the areas (km$^2$) of Dogger Bank Teesside A and Dogger Bank Teesside B that lie within the boundaries of the cSAC are provided earlier in **Tables 6.2** and **6.3**, with the predicted footprint of operational phase effects as identified in preceding impact statements, presented as a proportion of the cSAC in **Table 7.2**.

Table 7.2 Dogger Bank Teesside A and/or Dogger Bank Teesside B (and Teesside A & B) combined operational phase effect footprints as a proportion of the Dogger Bank cSAC

| Area | Dogger Bank Teesside A | Dogger Bank Teesside B | TOTAL (Dogger Bank Teesside A and B) |
|---|---|---|---|
| Area of cSAC (12,331km$^2$) | N/A | N/A | N/A |
| Maximum footprint of operational phase effects within Teesside A & B wind farm(s) / cSAC | 3.73km$^2$ | 3.73km$^2$ | 7.46km$^2$ |
| Maximum footprint of operational phase effects (cable protection and crossings) within Teesside A/B Dogger Bank Teesside A & B Export Cable Corridor(s) * / cSAC | 1.15km$^2$ | 0.79km$^2$ | 1.94km$^2$ |
| Total footprint of operational phase effects within Teesside A/B wind farm(s) and Dogger Bank Teesside A & B Export Cable Corridor(s) * / cSAC | 4.88km$^2$ | 4.52km$^2$ | 9.40km$^2$ |
| Teesside A/B operational phase effect footprint as % of overall cSAC | 0.04% | 0.04% | 0.08% |

* Only the footprint of effect within the parts of the Dogger Bank Teesside A & B Export Cable Corridor that lie within the cSAC boundary are listed here. Cable corridor "within SAC boundary" includes all of export cable within the main zone and the small section outside the main zone but still within the SAC boundary.

7.8.7. Operational phase effects on habitats within the cSAC will arise via permanent habitat loss caused by foundation installation and inter-array cable protection within the main sites as well as temporary habitat disturbance via jacking up activities and also via the placement of cable protection along the export cables (both along export cables within the zone and outside the zone but within the boundary of the cSAC). The overall footprint of operational effects that will affect habitats within the cSAC totals 4.88km$^2$ (0.04% of overall cSAC) for Dogger Bank Teesside A and 4.52km$^2$ (0.04% of overall cSAC for Dogger Bank Teesside B) – see **Table 7.2**.

7.8.8. The main impact assessment addressing permanent habitat loss of marine habitats within the main Dogger Bank Teesside A & B sites concluded a **minor adverse** impact on these habitats (VERs A, B and C) which fall within the cSAC boundary.

7.8.9. VERs A, B and C also occur within the Dogger Bank Teesside A & B Export Cable Corridor, as the boundary of the cSAC overlaps with the export cable at the most eastern section. A **minor adverse** impact on the VERs within the Dogger Bank Teesside A & B Export Cable Corridor via operational phase impacts is predicted.

7.8.10. With respect to effects of suspended sediment concentration and sedimentation, the spatial extent of this effect footprint is greater than that for direct physical disturbance but will still be a relatively small proportion of the overall cSAC area. As outlined in earlier impact assessments, the habitats present within the Dogger Bank cSAC (VERs A, B and C) also exhibit a low sensitivity to suspended sediment concentrations and sediment deposition and, therefore, a **negligible** impact on VERs A and B was concluded, with a **minor adverse** impact on VER C due to the component biotopes of this receptor exhibiting a slightly increased sensitivity to this effect.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.8.11. **Table 7.4** indicates a total footprint of temporary disturbance from both Dogger Bank Teesside A & B of 0.08% of the cSAC, representing a very small proportion of the overall habitats within the cSAC (which can be expected from the information available to be similar to those recorded in the study area). Therefore, the same conclusions made above in relation to Dogger Bank Teesside A or Dogger Bank Teesside B in isolation are predicted to remain valid for Dogger Bank Teesside A & B together.

7.8.12. As outlined above, an assessment of the potential for these impacts to affect the integrity of the cSAC, from a Habitats Regulations perspective, is contained in the **HRA Report**. The **HRA Report** provides sufficient information to enable a competent authority to undertake an Appropriate Assessment of the proposals.

7.8.13. The Appropriate Assessment process will formally consider any marine ecological impacts (and other impacts) against the structure and function and conservation objectives of the Dogger Bank cSAC (as well as other SAC/SPA sites) so that a determination of potential effects on the integrity of these sites can be undertaken.

## 7.9. Potential operational phase impacts on sites of marine conservation interest

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

7.9.1. The preceding impact assessments have discussed the potential for operational phase activities to produce effects that may impact benthic habitats in the Dogger Bank Teesside A & B study area. The benthic habitats have been grouped into VERs as per the approach set out in Section 3.3, with these VERs representing the receptors against which impacts have been assessed.

7.9.2. This particular impact assessment discusses the effects on benthic habitats described previously in the context of the following sites of marine nature conservation interest, for which examples occur within and around the Dogger Bank Teesside A & B study area;

- UK BAP Habitats;
- rMCZs; and
- OSPAR habitats and species.

7.9.3. It is important to note that potential impacts on the ecological elements of the sites of marine conservation interest listed above have already been assessed via the individual impact assessments presented up to this point. Therefore, to avoid repetition in the assessment process, the assessment of potential operational phase impacts on sites of marine conservation interest are presented below as a series of summary tables which make reference to the conclusions of previous impact assessments.

7.9.4. It should also be recognised that the preceding impact assessments have all been undertaken via an assessment of the sensitivity of receptors and the magnitude of effect. For the benthic receptors (VERs), the overall EIA sensitivity has been determined via a combination of ecological sensitivity of the receptor to a particular effect, as well as the value of the receptor, for example, whether or not it represents Annex I habitat. The value element of receptor sensitivity (see **Table 3.2**) already takes account of whether or not a habitat or species may be of conservation interest, which is therefore inherent within the assessment methodology.

7.9.5. The "receptor" heading in the following tables refers to the habitat/species of marine conservation interest (BAP Habitats in **Table 7.3** and rMCZs in **Table 7.4**) with the column headed "relevant VERs" identifying the VERs (as defined in **Table 4.4**) that apply to those habitats/species. The impact descriptions are those assessed previously via individual impact assessments, with any relevant mitigation and the residual impact from these previous impact assessments also presented.

Table 7.3 Potential operational phase impacts on BAP habitats

| Receptor | Relevant VERs (see Table 4.4) | Impact description | Mitigation | Residual impact |
|---|---|---|---|---|
| "Subtidal sands and gravels" BAP Habitat<br><br>**and**<br><br>"Mud habitats in deep water" BAP Habitat | A, B, C, D, E and F | Permanent loss of habitat via placement of project infrastructure (foundations, cable protection, scour protection) | None | **Negligible** (VERs D, E, F, G, H, I)<br><br>**Minor adverse** (VERs A, B, C) |
| | | Temporary impact on benthos due to physical disturbance caused by maintenance activities | None | **Negligible** (All VERs apart from VER C)<br><br>**Minor Adverse** (VER C) |
| | | Change in hydrodynamics and inter-related effects on benthos | None | **Negligible** (All VERs) |
| | | Increase in suspended sediment concentration due to scour associated with foundations | None | **Negligible** (All VERs apart from VER C)<br><br>**Minor Adverse** (VER C) |
| | | Increase in sediment deposition following increase in suspended sediment concentration due to scour associated with foundations | None | **Negligible** (All VERs) |
| | | Introduction of new habitat in the form of foundation structures, leading to potential colonisation | None | **Negligible** (All VERs) |
| | | Effect of electromagnetic fields on benthic organisms | Burial of cables where feasible | **Negligible** (All VERs) |

7.9.6. Based on the previous impact assessments conducted on the benthic receptors (VERs) that are also representative of these two BAP habitats, it is concluded that, overall, there will be a **negligible** impact on some of the benthic habitats that are component parts of the two marine BAP habitats within the Dogger Bank Teesside study area, with **minor adverse** impacts on other habitats (VER C).

7.9.7. With respect to rMCZs, neither Compass Rose and Runswick Bay rMCZs overlap spatially with the Dogger Bank Teesside A & B Export Cable Corridor. The only potential source of operational impact on these habitats is via the placement of cable protection and as this will only occur within the Dogger Bank Teesside A & B Export Cable Corridor and not on the habitats within these rMCZ boundaries, **no impact** is predicted via the operational phase on these rMCZs.

7.9.8. With respect to potential impacts on OSPAR threatened species and habitats, no such species or habitats are recorded within the Dogger Bank Teesside A & B study area, therefore, no impacts are predicted.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

7.9.9. The previous VER based impact assessments concluded that even if Dogger Bank Teesside A & B operated at the same time there would be no change in the level of any of the impacts predicted via either project operating in isolation. Therefore, the conclusions with respect to potential impacts on BAP habitats and rMCZs presented above are also relevant to this scenario.

## 7.10. Monitoring of operational phase impacts

7.10.1. Potential operational phase impacts on benthic ecology include direct loss of habitat, indirect loss/alteration of benthic habitats due to changes in local hydrodynamic processes, increased suspended sediments and deposition due to scour effects and colonisation of structures, potentially by invasive species.

7.10.2. The benthic monitoring outlined in Section 6.9 will be designed in a way that enables these potential operational phase impacts to be determined. The location of sampling stations within close proximity to installed foundations will ensure that any near-field changes in benthic habitats will be identified. Any monitoring programme will also include assessment of selected foundation structures in order to gather data on the long-term behaviour of colonising species on these structures.

7.10.3. Post-construction annual benthic grab and DDV survey data will be compared against pre-construction baseline data to determine any statistically significant changes in benthic habitats. These data will be combined with sidescan data from geophysical surveys to monitor any broad-scale benthic habitat changes.

7.10.4. The exact time-frame/frequency of post-construction monitoring will be decided via consultation with key regulatory bodies but it is noted that under (deemed) Marine Licences it is possible to carryout monitoring over the lifetime of the project. Therefore, it is expected that post-construction monitoring of marine ecological habitats will be conducted at more infrequent, intervals throughout the lifetime of the development (in contrast to previous FEPA requirements for surveys in years one to three post-construction only).

# 8. Assessment of Impacts during Decommissioning

## 8.1. Increased suspended sediment concentration and sediment deposition

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

8.1.1. During the decommissioning phase the worst case scenario is for all components of the project to be removed, i.e. foundations, scour protection etc.

8.1.2. During removal of these project components there will be short-term increases in suspended sediment concentration (and subsequent deposition) from the plume generated by the disturbance of the seabed required to remove these structures.

8.1.3. Based on the outputs of the physical process modelling work, any effects produced during decommissioning are considered to be less than those described during the construction phase, due to absence of seabed preparation or pile drilling, which are the main sources of increased suspended sediment concentration during the construction phase.

8.1.4. Assuming that the general benthic habitats and communities of the site remain as per the existing environment, with the same sensitivities to suspended sediment concentration and sediment deposition, this decommissioning impact will be no greater than that assessed in the construction phase. Therefore, a **negligible** impact on benthic habitats via increased suspended sediment concentration and sediment deposition during the decommissioning phase is predicted.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

8.1.5. As for Dogger Bank Teesside A or Dogger Bank Teesside B in isolation above, a **negligible** impact is predicted on benthic habitats via increased suspended sediment concentration and sediment deposition during the decommissioning phase.

## 8.2. Loss of species colonising hard structures

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

8.2.1. Removal of all structures that represent hard substrate from the boundaries of the wind farm and Dogger Bank Teesside A & B Export Cable Corridor (foundations, scour protection, cable protection etc.) will lead to a loss of habitat for any colonising species that may have utilised these hard substrates. Based on the worst-case scenario of permanent habitat loss defined in the operational phase impact section, it can be noted that 6.40km$^2$ of hard substrate will be lost (Dogger Bank Teesside A) via the decommissioning phase. Following removal of these structures, areas of bare, un-colonised sediment will be created, which will be similar in nature to areas subjected to activities such as marine aggregate extraction.

8.2.2. Based on data on recovery of benthic communities from this activity, and noting that the dominant hydrodynamic and sedimentary processes in the wider study area are assumed to remain following decommissioning, it is predicted that recovery of these areas of un-colonised sediment to communities found pre-construction will occur within five years of the end of decommissioning.

8.2.3. Due to the localised nature and limited extent of the loss of species colonising the hard substrate foundations, and the high recoverability of the subsequently exposed substrate and communities associated with VER A and B back to their preconstruction state (i.e. within five years), it is predicted that the impact will be **negligible**.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

8.2.4. The same effects as outlined above are predicted to arise for the decommissioning phase of both Dogger Bank Teesside A and Dogger Bank Teesside B together, with the only difference being a greater amount of hard substrate lost (12.53km$^2$). A **negligible** impact is predicted.

## 8.3. Temporary disturbance to habitats via removal of cables

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

8.3.1. The specific removal of buried cables, which during the operational phase were covered by sediment that will have supported benthic communities, will result in a temporary loss of these habitats, with subsequent impact on these benthic communities. As per the temporary disturbance impacts assessed during the construction phase, these will be localised and will only affect a small proportion of habitats that are widespread throughout this region. As any temporary disturbed areas will return to pre-disturbance levels within a period of between six months to five years, this impact is judged to be **negligible**.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

8.3.2. The same effects as outlined above are predicted to arise for the decommissioning phase of both Dogger Bank Teesside A and Dogger Bank Teesside B together, with the only difference being a greater area of disturbance to benthic habitats as a result of having to remove a greater amount of export and array cables for the two projects together. A **minor adverse** impact is predicted.

## 8.4. Potential decommissioning phase impacts on the Dogger Bank cSAC

### Dogger Bank Teesside A or Dogger Bank Teesside B in isolation

8.4.1. Decommissioning phase impacts on the Dogger Bank cSAC are predicted to be no greater than those predicted during the construction phase, with **negligible** and/or **minor adverse** impacts on the various habitats within the cSAC.

### Dogger Bank Teesside A and Dogger Bank Teesside B together

8.4.2. Decommissioning phase impacts on the Dogger Bank cSAC are predicted to be no greater than those predicted during the construction phase, with **negligible** and/or **minor adverse** impacts on the various habitats within the cSAC.

## 8.5. Monitoring of decommissioning phase impacts

8.5.1. In order to monitor potential decommissioning phase impacts, a similar survey design and programme as developed in the pre-construction and first three years of the operational phase will be developed during decommissioning.

8.5.2. A pre-decommissioning survey will be undertaken to determine the baseline conditions prior to decommissioning, followed by a minimum of one survey once all decommissioning works are completed.

# 9. Inter-relationships

9.1.1. In order to address the environmental impact of the proposed development as a whole, this section establishes the inter-relationships between marine and intertidal ecology and other physical, environmental and human receptors. The objective is to identify where the accumulation of residual impacts on a single receptor, and the relationship between those impacts, gives rise to a need for additional mitigation.

9.1.2. **Table 9.1** summarises the inter-relationships that are considered of relevance to marine and intertidal ecology and identifies where they have been considered within this ES. No inter-relationships have been identified where an accumulation of residual impacts on marine and intertidal ecology, and the relationship between those impacts, gives rise to a need for additional mitigation.

9.1.3. **Chapter 31 Inter-relationships** provides a holistic overview of all the inter-related impacts associated within the proposed development.

Table 9.1 Inter-relationships relevant to the assessment of marine and intertidal ecology

| Inter-relationships | Section where addressed | Linked chapter |
|---|---|---|
| **All phases** | | |
| Impacts on benthos due to a change in hydrodynamics | Impacts on benthos are discussed throughout Sections 6 – 8 of this chapter | **Chapter 9 Marine Physical Processes** |
| Impacts on benthos due to the potential release of pollutants from sediment and accidental spillages as well as an increase in turbidity | As above | **Chapter 10 Marine Water and Sediment Quality** |
| Impacts on benthos in context of prey item for ornithological resources. | As above | **Chapter 11 Marine and Coastal Ornithology** |
| Impacts on benthos/benthic habitat in context of (a) prey items for fish species and (b) spawning /nursery habitats for fish. | As above | **Chapter 13 Fish and Shellfish Ecology** |
| Effects on benthos / benthic habitats as a result of potential changes in commercial fishing activity within the project site | An assessment of the effects of commercial fishing activity on the benthos is beyond the scope of this assessment. However, it is noted that if there was a reduction in trawling and dredging activity around the wind farm areas (note that this is not confirmed as being the case), there could be a positive effect on the benthic environment in general. | **Chapter 15 Commercial Fisheries**. |

# 10. Cumulative Impacts

## 10.1. CIA strategy and screening

10.1.1. This section describes the CIA for marine and intertidal ecology taking into consideration other plans, projects and activities. A summary of the CIA is presented in **Chapter 33 Cumulative Impact Assessment**.

10.1.2. Forewind has developed a strategy (the 'CIA Strategy') for the assessment of cumulative impacts in consultation with statutory stakeholders including the MMO, the JNCC, Natural England and Cefas. Details of the approach to cumulative impact assessment adopted for this ES are provided in **Chapter 4.**

10.1.3. In its simplest form the Strategy involves consideration of:

- Whether impacts on a receptor can occur on a cumulative basis between the wind farm project(s) subject to the application(s) and other wind farm projects, activities and plans in the Dogger Bank Zone (either consented or forthcoming); and
- Whether impacts on a receptor can occur on a cumulative basis with other activities, projects and plans outwith the Dogger Bank Zone (e.g. other offshore wind farm developments), for which sufficient information regarding location and scale exist.

10.1.4. The strategy recognises that data and information sufficient to undertake an assessment will not be available for all potential projects, activities, plans and / or parameters, and seeks to establish the 'confidence' Forewind can have in the data and information available.

10.1.5. There are two key steps to the Forewind CIA strategy, which both involve 'screening' in order to arrive, ultimately, at an informed, defensible and reasonable list of other plans, projects and activities to take forward in the assessment.

The first step in the CIA for marine and intertidal ecology involved an appraisal of the key impacts relevant to each of the receptors that have been identified (**Table 10.1**). For each impact, the potential for impacts to occur on a cumulative basis has been identified, both within and beyond the Dogger Bank Zone; the confidence in the data and information available to inform the CIA has been appraised (following the methodology set out in **Chapter 4**); and the other activities that could contribute to these impacts has been identified.

10.1.6. This also identifies where cumulative impacts are not anticipated, thereby screening them out from further assessment. For marine and intertidal ecology, the potential for cumulative impacts is identified in relation to direct habitat loss and / or disturbance (via placement of project infrastructure), indirect impacts via increased suspended sediment concentration and sediment deposition, indirect impact via changes in hydrodynamic processes and the introduction of hard substrate leading to colonisation.

## Table 10.1 Potential cumulative impacts (impact screening)

| Impacts | Dogger Bank Zone Dogger Bank Teesside A & B Export Cable Corridor (within 1km) | | Beyond 1km from the Dogger Bank Zone and Dogger Bank Teesside A & B Export Cable Corridor | | Rationale for where no cumulative impact is expected |
|---|---|---|---|---|---|
| | **Potential for cumulative impact** | **Data confidence** | **Potential for cumulative impact** | **Data confidence** | |
| Direct impact via habitat disturbance and/or loss (due to placement of project infrastructure | Yes | High | Yes | Medium | N/A |
| Indirect impact via increased suspended sediment concentration and sediment deposition (construction phase) | Yes | Medium-High | Yes | Low-Medium | N/A |
| Direct impact via permanent habitat loss (presence of project infrastructure in operational phase) | Yes | High | Yes | Medium | N/A |
| Indirect impact via increased suspended sediment concentration and sediment deposition (via scour in operational phase) | Yes | Medium-High | Yes | Low | N/A |
| Direct impact via vessel activity (jacking-up and anchoring) in operational phase for operation and maintenance activities | Yes | High | Yes | Low-Medium | N/A |

| Impacts | Dogger Bank Zone Dogger Bank Teesside A & B Export Cable Corridor (within 1km) | | Beyond 1km from the Dogger Bank Zone and Dogger Bank Teesside A & B Export Cable Corridor | | Rationale for where no cumulative impact is expected |
|---|---|---|---|---|---|
| | Potential for cumulative impact | Data confidence | Potential for cumulative impact | Data confidence | |
| Direct impact of introduction of hard substrate leading to colonisation | Yes | High | Yes | Low-Medium | N/A |

10.1.7. Where the first step has indicated the potential for cumulative impacts, the second step in the CIA for marine and intertidal ecology has involved the identification of the actual individual plans, projects and activities that may result in cumulative impacts on marine and intertidal habitats for inclusion in the CIA.

10.1.8. In order to inform this, Forewind has produced an exhaustive list of plans, projects and activities occurring within a very large study area encompassing the greater North Sea and beyond (referred to as the 'CIA Project List', (see **Chapter 4**). The list has been appraised, based on the confidence Forewind has in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out.

10.1.9. The plans, projects and activities relevant to marine and intertidal ecology are presented in **Table 10.2** and **Figure 4.19** along with the results of the screening exercise that identifies whether there is sufficient confidence to take these forward in a detailed cumulative assessment.

10.1.10. It should be noted that:

- Where Forewind is aware that a plan, project or activity could take place in the future, but has no information on how the plan, project or activity will be executed, it is screened out of the assessment; and
- Existing projects, activities and plans are already having an impact and so are part of the existing environment as it has been assessed throughout this ES. Therefore these projects have not been included in the cumulative assessment. This includes commercial fishing, whereby the benthic habitats that currently exist within the Dogger Bank Zone and wider North Sea region are already widely influenced by this activity.

10.1.11. The potential impacts identified during the construction, operation and decommissioning phases of Dogger Bank Teesside A & B (Sections 6 to 8) that could result in cumulative impacts are described below.

Table 10.2 Cumulative impact assessment screening for marine and intertidal ecology (project screening)

| Type of project | Project title | Project status | Predicted construction / development period | Distance from Dogger Bank Teesside A & B (km) | Confidence in project description | Confidence in project data | Carried forward to CIA | Rationale for not carrying into CIA |
|---|---|---|---|---|---|---|---|---|
| Offshore Wind Farm | Dogger Bank Creyke Beck A | Application | Construction may start from 2016 | 28.05 / 4.05 km from Dogger Bank Teesside A / B (wind farm boundary<br><br>0.78km from Dogger Bank Teesside A & B Export Cable Corridor | High | High | Yes | N/A |
| Offshore Wind Farm | Dogger Bank Creyke Beck B | Application | Construction may start from 2016 | 45.97/ 6.20 km from Dogger Bank Teesside A / B (wind farm boundary<br><br>Overlaps Dogger Bank Teesside A & B Export Cable Corridor | High | High | Yes | N/A |
| Offshore Wind Farm | Dogger Bank Teesside C | Pre-Application | Construction may start from 2016 | 31.10/8.06 km from Dogger Bank Teesside A / B (wind farm boundary<br><br>24.20 km from Dogger Bank Teesside A & B Export Cable Corridor | Low | High | Yes | N/A |
| Offshore Wind Farm | Dogger Bank Teesside D | Pre-Application | Construction may start from 2016 | 13.46 /8.08 km from Dogger Bank Teesside A / B (wind farm boundary)<br><br>20.96 km from Dogger Bank Teesside A & B Export Cable Corridor | Low | High | Yes | N/A |
| Offshore Wind Farm | Dogger Bank Other Developments | Potential | Not confirmed | Not confirmed | Low | Low | **No** | **Low data confidence** |

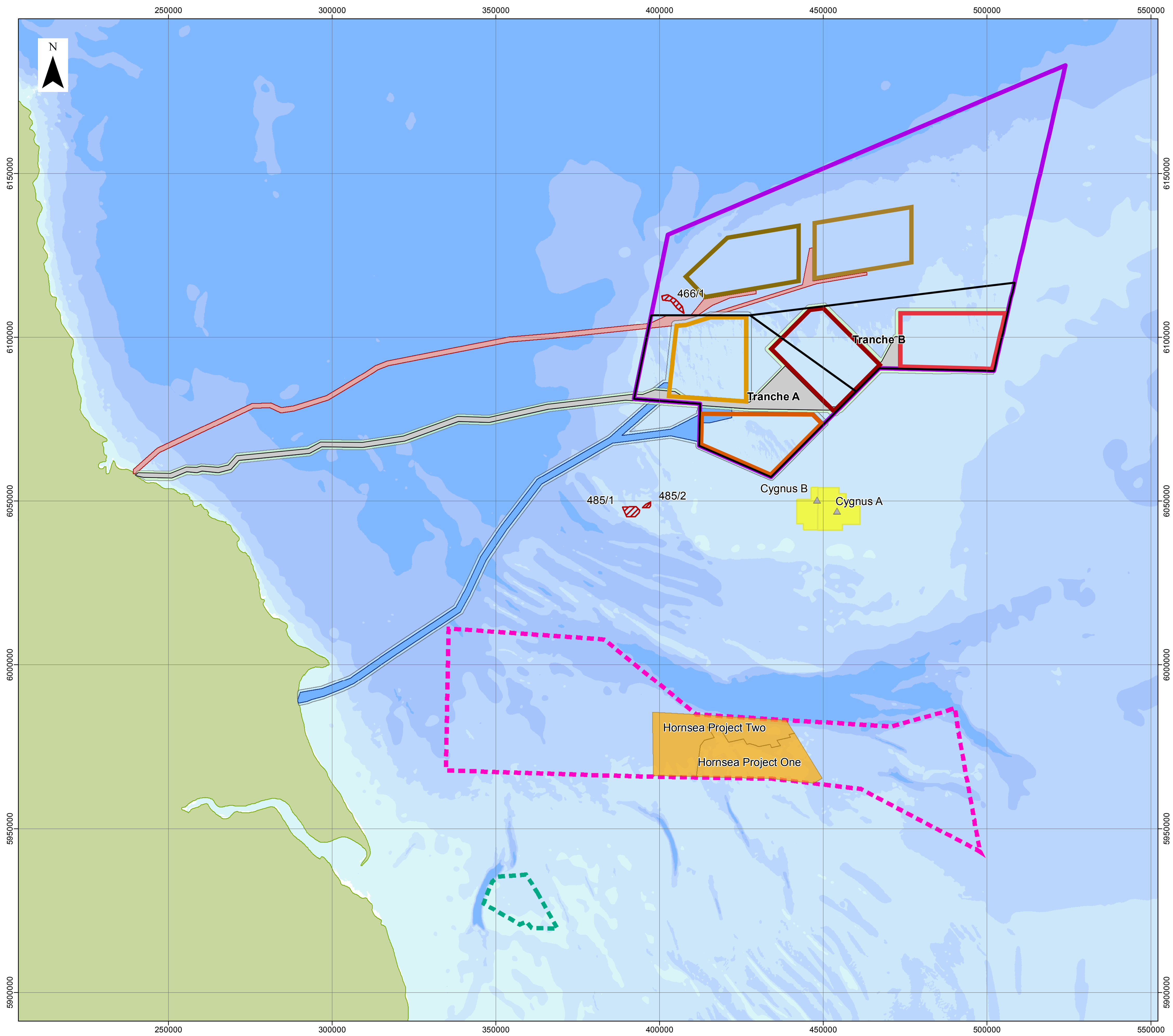
 

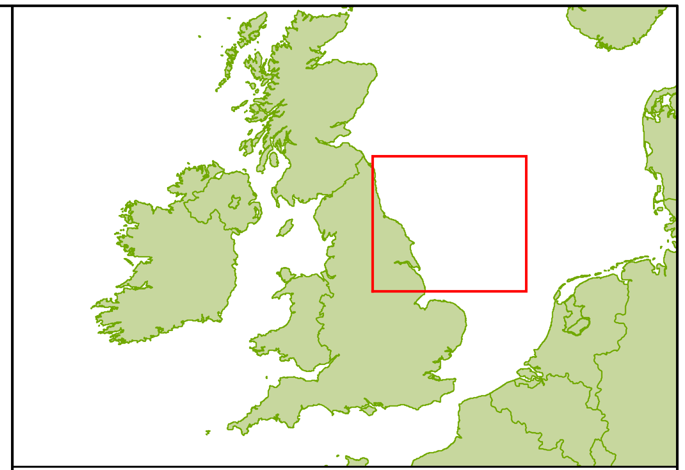
| Type of project | Project title | Project status | Predicted construction / development period | Distance from Dogger Bank Teesside A & B (km) | Confidence in project description | Confidence in project data | Carried forward to CIA | Rationale for not carrying into CIA |
|---|---|---|---|---|---|---|---|---|
| Offshore Wind Farm | Hornsea Project One | Application | Construction may start from 2015 | 115.81/ 98.68 km from Dogger Bank Teesside A / B (wind farm boundary)<br><br>96.80km from Dogger Bank Teesside A & B Export Cable Corridor | High | Medium | Yes | N/A |
| Offshore Wind Farm | Hornsea Project Two | Pre-Application | Construction may start from 2017 | 112.59/94.92 km from Dogger Bank Teesside A / B (wind farm boundary)<br><br>94.81km from Dogger Bank Teesside A & B Export Cable Corridor | Medium | Medium | Yes | N/A |
| Offshore Wind Farm | Hornsea (Other Developments) | Potential | Not confirmed | Not confirmed | Low | Low | **No** | **Low data confidence** |
| Offshore Wind Farm | Triton Knoll | Application | Construction may start from 2017 | 191.78/169.24 km from Dogger Bank Teesside A / B (wind farm boundary)<br><br>137.39 km from Dogger Bank Teesside A & B Export Cable Corridor | High | High | **No** | **Distance from Teesside A and B boundaries** |
| Aggregate extraction | Area 466/1 | Application area | Decision expected 2012 | 65 / 28km from Dogger Bank Teesside A / B (wind farm boundary)<br><br>24.02km from Dogger Bank Teesside A & B Export Cable Corridor | High | Medium | Yes | N/A |

| Type of project | Project title | Project status | Predicted construction / development period | Distance from Dogger Bank Teesside A & B (km) | Confidence in project description | Confidence in project data | Carried forward to CIA | Rationale for not carrying into CIA |
|---|---|---|---|---|---|---|---|---|
| Aggregate extraction | Area 485/1 | Application area | Not confirmed | 90 / 63km from Dogger Bank Teesside A / B (wind farm boundary)<br><br>32.37km from Dogger Bank Teesside A & B Export Cable Corridor | High | Medium | Yes | N/A |
| Aggregate extraction | Area 485/2 | Application area | Not confirmed | 86 / 59km from Dogger Bank Teesside A / B (main site boundary)<br><br>40.43km from Dogger Bank Teesside A & B Export Cable Corridor | High | Medium | Yes | N/A |



## LEGEND

- Dogger Bank Zone
- Tranche boundary
- Dogger Bank Creyke Beck A
- Dogger Bank Creyke Beck B
- Dogger Bank Teesside A
- Dogger Bank Teesside B
- Dogger Bank Teesside C
- Dogger Bank Teesside D
- Dogger Bank Teesside A & B Export Cable Corridor
- Dogger Bank Teesside A & B temporary works area
- Dogger Bank Creyke Beck Export Cable Corridor
- Dogger Bank Creyke Beck temporary works area
- Dogger Bank Teesside C & D export cable corridor
- Cygnus proposed subsurface infrastructure
- Cygnus gas field development
- Aggregate application areas
- Hornsea Project Zone
- Hornsea Zone
- Triton Knoll

0 10 20 40
Kilometres

Data Source:
Oil & Gas © DECC, 2013
Energy Projects and Aggregate Areas © TCE, 2013.
Background bathymetry image derived in part from TCarta data © 2009

PROJECT TITLE

*DOGGER BANK TEESSIDE A & B*

DRAWING TITLE

**Figure 10.1 Other plans, projects and activities for cumulative impact assessment**

| VER | DATE | REMARKS | Drawn | Checked |
|---|---|---|---|---|
| 1 | 24/05/2013 | Draft | LW | RZ |
| 2 | 03/10/2013 | PEI3 | JE | RZ |
| 3 | 07/02/2014 | DCO Submission | JE | RZ |

DRAWING NUMBER:

**F-OFL-MA-209**

| SCALE | PLOT SIZE | DATUM | PROJECTION |
|---|---|---|---|
| 1:1,200,000 | A3 | WGS84 | UTM31N |



FOREWIND

## 10.2. Temporary disturbance to marine habitats during construction (seabed preparation, cable installation, vessel jacking-up etc.)

10.2.1. The impact assessment for Dogger Bank Teesside A & B concluded that there would be a **negligible** residual impact on all existing marine habitats within the Dogger Bank Teesside A & B area and Dogger Bank Teesside A & B Export Cable Corridor, (apart from VER C, where a **minor adverse** impact was predicted) as a result of temporary disturbance during the construction phase.

10.2.2. This conclusion was based on the fact that a maximum of 41.59km$^2$ of the overall area of the two sites (and Dogger Bank Teesside A & B Export Cable Corridor) would be subject to temporary disturbance, with the habitats affected having a low sensitivity to this type of effect and a high recoverability.

10.2.3. **Table 10.3** (below) lists the areas of temporary habitat disturbance loss presented in the ES's for various projects that have been included in this cumulative assessment. For Dogger Bank Teesside C & D, which are yet to be subject to EIA, it is assumed that temporary habitat loss in the construction phase will be the same as per Dogger Bank Teesside A & B, therefore, the same values are used.

Table 10.3 Temporary habitat loss from all projects considered in cumulative assessment

| Type of project | Project title | Predicted amount of temporary habitat loss (via construction activities) |
|---|---|---|
| Offshore Wind Farm | Dogger Bank Creyke Beck A | 18.61km$^2$ |
| Offshore Wind Farm | Dogger Bank Creyke Beck B | 18.28km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside A | 21.72km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside B | 20.83km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside C | * 21.72km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside D | * 21.72km$^2$ |
| Offshore Wind Farm | Hornsea Project One | 13.37km$^2$ |
| Offshore Wind Farm | Hornsea Project Two | * 13.37km$^2$ |
| Marine Aggregate | Area 466/1 | **1.11km$^2$ |
| Marine Aggregate | Area 485/1 | **1.21km$^2$ |
| Marine Aggregate | Area 485/2 | **0.25km$^2$ |
| TOTAL | | 152.19km$^2$ |

* Values of habitat loss assumed, as EIA for Teesside C & D and Hornsea Project Two not undertaken to date

** Assumed that a nominal 10% of the area of each of these is dredged at any one time, leading to temporary habitat disturbance, 10.2.2. From **Table 10.3** it can be noted that when the proposed Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D developments are combined with Hornsea Project One and Two and also marine aggregate sites in the wider region around Dogger Bank, a total of 152.19km$^2$ of temporary habitat disturbance is predicted. To place the extent of this temporary subtidal habitat disturbance in context with similar habitat in the wider region, the area of subtidal habitat in the southern North Sea Marine Natural Area, within which much of the Dogger Bank Teesside A & B development lies, amounts to 64,786km$^2$. Therefore, this temporary disturbance of 152.19km$^2$ represents 0.23% of similar habitat in this part of the southern North Sea alone.

10.2.3. It is also assumed that (a) the majority of this temporary habitat disturbance will arise in habitat types that are widespread across the region and as such, any permanent loss via project developments will not lead to the loss of a discrete habitat type from the southern North Sea and (b) will also exhibit a low sensitivity and high recoverability to temporary disturbance effects.

10.2.4. Therefore, in conclusion, it is predicted that there will be a **negligible cumulative impact** on benthic habitats across the wider southern North Sea region via temporary habitat disturbance from projects within the Dogger Bank Zone and other projects outside the zone.

## 10.3. Increased suspended sediment concentration and sediment deposition during construction phase

10.3.1. The impact assessment for Dogger Bank Teesside A & B concluded that there would be a negligible impact on benthic habitats due to increased suspended sediment concentration and sediment deposition produced during the construction phase of the project. Cumulative impacts of suspended sediment concentration and sediment deposition will only arise if there is both a spatial and temporal overlap of project construction stages and the resultant sediment plumes generated via different projects overlap to produce a cumulative impact.

10.3.2. Based on the marine physical processes cumulative impact assessment undertaken as part of this EIA, the following conclusions can be reached with respect to potential spatial and temporal overlap of sediment plumes (and resultant deposition) from Dogger Bank Teesside A & B and other developments in the Dogger Bank Zone and wider region.

10.3.3. Assuming that a similar construction sequence is adopted for foundation installation and cable laying in all other projects at the same time as Dogger Bank Teesside B and Dogger Bank Creyke Beck B, potential exists for some of the respective plumes to interact, creating a larger overall plume, with higher suspended sediment concentrations and, potentially, a greater depositional footprint on the seabed. However, given that the numerical modelling undertaken for the individual projects (Dogger Bank Teesside B and Dogger Bank Creyke Beck B) has identified that the maximum thickness of sediment that would remain deposited on the seabed at the end of the 30-day simulation periods would be less than 0.1mm (for both conical GBS and 12m pile foundation scenarios), it is considered, using expert judgment, that the potential for thick sequences of sediment persistently accumulating on the seabed due to plume interaction from all six projects is low, even if the construction programmes coincide.

10.3.4. Cumulative effects of Dogger Bank Teesside A, B, C & D and Dogger Bank Creyke Beck A & B with other offshore wind farms and aggregate license areas have also been considered with respect to sediment plume interaction. It is unlikely that the construction plumes of other wind farms (in particular Hornsea Project One) will interact with the Dogger Bank plumes. Plumes from adjacent aggregate dredging areas would also be small and short-lived in comparison to the Dogger Bank plumes, therefore**,** no cumulative effects are anticipated via increased suspended sediment plumes and the residual impact remains as **negligible**.

## 10.4. Permanent loss of marine habitats via installation of project infrastructure associated with offshore wind farm development and other activities

10.4.1. A cumulative effect of permanent loss of habitats due to the construction of foundations and associated project infrastructure, such as scour and cable protection and vessel mooring is predicted via additional projects in the Dogger Bank Zone and other activities / development outside the zone, including further offshore wind developments such as Hornsea Project One and Project Two.

10.4.2. **Table 10.4** lists the areas of permanent habitat loss presented in the ES's for various projects that have been included in this cumulative assessment. For Dogger Bank Teesside C & D, which is yet to be subject to the EIA process, it is assumed that permanent habitat loss will be the same as per Dogger Bank Teesside A & B, therefore, the same values are used.

Table 10.4 Permanent habitat loss from all projects considered in cumulative assessment

| Type of project | Project title | Predicted amount of permanent habitat loss (via foundations, cable protection etc. in operational phase) |
|---|---|---|
| Offshore Wind Farm | Dogger Bank Creyke Beck A | 4.98km$^2$ |
| Offshore Wind Farm | Dogger Bank Creyke Beck B | 4.88km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside A | 6.40km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside B | 6.13km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside C | * 6.40km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside D | * 6.40km$^2$ |
| Offshore Wind Farm | Hornsea Project One | 13.37km$^2$ |
| Offshore Wind Farm | Hornsea Project Two | * 13.37km$^2$ |
| **TOTAL** | | **61.93km$^2$** |

* Values of habitat loss assumed, as EIA for Teesside C and D and Hornsea Project Two not undertaken to date

10.4.3. From **Table 10.4** it can be noted that the proposed Dogger Bank Teesside A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D developments are combined with Hornsea Project One and Two, a total of 61.93km$^2$ of permanent habitat loss is predicted. To place the extent of this permanent habitat loss in context with similar habitat in the wider region, the area of subtidal habitat in the southern North Sea Marine Natural Area, within which much of the Dogger Bank Teesside A & B development lies, amounts to 64,786km$^2$. Therefore, this permanent loss of 61.93km$^2$ represents 0.09% of similar habitat in this part of the southern North Sea alone.

10.4.4. It is also assumed that (a) the majority of this permanent habitat loss will arise in habitat types that are widespread across the region and as such, any permanent loss via project developments will not lead to the loss of a discrete habitat type from the southern North Sea and (b) that permanent loss of any particularly sensitive benthic habitats (e.g. Annex I reef) has been avoided by the project-specific EIA processes, which should have identified any such habitats and proposed appropriate mitigation measures (micro-siting) to avoid damage to these habitats.

10.4.5. Therefore, in conclusion, it is predicted that there will be a **minor adverse** cumulative impact on benthic habitats in the wider region such as those that represent VERs A, B and C within the Dogger Bank Teesside A & B project boundaries, and a **negligible** cumulative impact on all other benthic habitats across the wider southern North Sea region via permanent habitat loss from projects within the Dogger Bank Zone and other projects outside, specifically Hornsea Project One and Project Two.

## 10.5. Increased suspended sediment concentration and sediment deposition during operational phase.

10.5.1. In terms of suspended sediment plumes and deposition created by all six Dogger Bank projects operating concurrently, after two years, the maximum concentration was predicted to increase to greater than 200mg/l in areas up to 22km long and 7km wide along the boundaries of the projects. Across all projects, suspended sediment concentrations are generally greater than 50mg/l, reducing to the background of 2mg/l up to approximately 55km from the project boundaries. Average suspended sediment concentrations are 50-100mg/l across the boundaries of Dogger Bank Creyke Beck A & B, reducing to the background of 2mg/l up to approximately 39km from the project boundaries.

10.5.2. After two years, maximum sediment deposition of 5mm occurs across all project areas with deposition reducing to less than 0.1mm up to 43km from the boundaries. Average deposition is predicted to be 0.1-0.5mm reducing to 0.1mm close to the southern boundaries and up to approximately 32km north of the northern boundaries. Time series of bed thickness show that it in places it may exceed 3mm continuously for up to 10.17 days. Over most of the deposit footprint the thickness only exceeds 1mm for several days continuously. The predicted bed thickness at the end of the 30-day simulation period was less than 0.1mm across the depositional area.

10.5.3. Therefore, a **minor adverse** cumulative impact is predicted due to the interaction of operational phase plumes from Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D as the benthic fauna exposed to the cumulative interaction of these plumes will be adapted to temporary high suspended sediment loads and sediment deposition.

## 10.6. Direct impact via vessel activity (jacking-up and anchoring in operational phase)

10.6.1. For Dogger Bank Teesside A & B built (and operated) together, the worst-case impact scenario for temporary disturbance over the lifetime of the project (within the main site boundaries due to maintenance vessels) was a disturbance footprint of 1.81km$^2$ over a combined project area of 1153.90km$^2$ (0.16% of overall project areas).

10.6.2. **Table 10.5** lists the areas of temporary habitat disturbance via jacking-up in the operational phase for various projects that have been included in this cumulative assessment. For Dogger Bank Teesside C & D, which are yet to be subject to EIA, it is assumed that temporary habitat disturbance will be the same as per Dogger Bank Teesside A & B, therefore, the same values are used.

Table 10.5 Temporary habitat loss from all projects considered in cumulative assessment

| Type of project | Project title | Predicted amount of temporary habitat loss (via jacking-up in operational phase) |
| --- | --- | --- |
| Offshore Wind Farm | Dogger Bank Creyke Beck A | 0.90km$^2$ |
| Offshore Wind Farm | Dogger Bank Creyke Beck B | 0.90km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside A | 0.90km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside B | 0.90km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside C | * 0.90km$^2$ |
| Offshore Wind Farm | Dogger Bank Teesside D | * 0.90km$^2$ |
| Offshore Wind Farm | Hornsea Project One | 0.71km$^2$ |
| Offshore Wind Farm | Hornsea Project Two | * 0.71km$^2$ |
| **TOTAL** | | **6.82km$^2$** |

* Values of habitat loss assumed, as EIA for Teesside C & D and Hornsea Project Two not undertaken to date

10.6.3. Whilst these individual amounts of disturbance do represent a cumulative impact on benthic habitats across the wider region, when considered together, this impact is predicted to be **negligible.**

10.6.4. This conclusion is reached by noting the same factors as outlined above for permanent habitat loss, such as the widespread nature of much of these habitats throughout the southern North Sea, but also noting the fact that the majority of habitats that will be subject to this particular effect will have a low sensitivity to disturbance and a high recoverability.

## 10.7. Cumulative impact of introduction of hard substrates in form or foundations / scour & cable protection into a mainly sedimentary environment (southern North Sea)

10.7.1. Colonisation of hard substrates (introduced in form of foundations and scour/cable protection) will occur on all projects within the Dogger Bank Zone and also other wind farm development projects outside the zone. The amount of hard substrate introduced to the wider region via these developments will be broadly similar as a proportion (%) of the existing sedimentary environment as that discussed above with regard to the cumulative impact of permanent habitat loss.

10.7.2. Of the two types of effect described in the earlier impact assessment section for Dogger Bank Teesside A & B, namely "reef" effects and potential "stepping-stones" for colonisation by invasive species, these are both predicted to arise at each individual site. However there are already areas of hard substrate within the area in the form of ship wrecks, therefore, it is likely that species colonising the foundations and scour/cable protection will not be new species to the area.

10.7.3. However, if these effects do actually arise in reality (which is uncertain), whilst there may be some degree of connectivity between different projects, the spatial scale of them will be very localised and, in the main, due to the distance between the various structures associated with the projects identified in this cumulative impact assessment, it is not predicted that there will be any form of cumulative impact between different projects.

## 10.8. Impact on the Dogger Bank cSAC via cumulative impacts

10.8.1. Scope exists for cumulative impacts on the Dogger Bank cSAC via construction and operation of Dogger Bank Teesside A & B with other Dogger Bank projects (Dogger Bank Creyke Beck A & B; Dogger Bank Teesside C & D) and also marine aggregate sites located within the boundary of the cSAC.

10.8.2. Potential cumulative impacts will include all those listed in the preceding cumulative assessment section, namely temporary habitat disturbance, increased suspended sediment concentrations and sediment deposition, permanent habitat loss and colonisation of hard substrate.

10.8.3. Construction phase impacts on these habitats via temporary habitat disturbance and increased suspended sediments and deposition associated with Dogger Bank Teesside A & B have been assessed in preceding sections. Therefore, this cumulative assessment aims to describe and quantify these potential construction phase impacts, along with similar construction phase impacts for other projects located within the boundary of the Dogger Bank cSAC, in the context of this designated site.

10.8.4. The following assessment should be read in conjunction with the **HRA Report** for Dogger Bank Teesside A & B.

10.8.5. Based on the SAC Selection Assessment Document (JNCC, Version 9.0, August 2011), the overall area of the Dogger Bank cSAC is 12,331km$^2$. With respect to potential sources of cumulative impact on the cSAC, this assessment has considered construction phase impacts from six wind farm projects within the Dogger Bank Round 3 Zone as well as habitat disturbance from the three marine aggregate licence areas that also lie within the cSAC boundary and which may become active at or around the same time as construction of any of the Dogger Bank wind farm sites.

Table 10.6 Temporary habitat loss from all projects within Dogger Bank cSAC

| Project | Footprint of construction phase effects (temporary disturbance) within cSAC boundary (via works in main site and Dogger Bank Teesside A & B Export Cable Corridors*) | Construction phase effect footprint as % of overall cSAC |
|---|---|---|
| Dogger Bank Creyke Beck A & B | 33.54km$^2$ | 0.27% |
| Dogger Bank Teesside A & B | 35.70km$^2$ | 0.29% |
| Dogger Bank Teesside C & D | ** 35.70km$^2$ | 0.29% |
| Area 466/1 | *** 1.11km$^2$ | 0.01% |
| Area 485/1 | **1.21km$^2$ | 0.01% |
| Area 485/2 | **0.25km$^2$ | 0.002% |
| **TOTAL** | **107.51km$^2$** | **0.87%** |

* Only the footprint of effect within the parts of the Dogger Bank Teesside A & B Export Cable Corridor that lie within the cSAC boundary are listed here. The cable corridor "within the cSAC boundary" includes all of the export cable within the main zone and the small section outside the main zone but still within the SAC boundary.
** Values of habitat loss assumed, as EIA for Dogger Bank Teesside C & D and Hornsea Project Two not undertaken to date.
*** Assumed that a nominal 10% of the area of each of these is dredged at any one time, leading to temporary habitat disturbance

10.8.6. From **Table 10.6** it can be noted that 0.87% of the cSAC could be affected by direct temporary habitat disturbance created by the projects listed, all of which are located within the boundaries of the cSAC.

10.8.7. Whilst noting the very small proportion of the overall cSAC that would be affected by temporary disturbance during construction of all these projects, it is also important to note that the majority of habitats that would be affected within the cSAC boundary also have a low sensitivity to temporary disturbance, with only **negligible** and **minor adverse** impacts predicted on these habitats via earlier impact assessments.

10.8.8. With respect to effects of suspended sediment concentration and sedimentation, the spatial extent of this effect footprint is greater than that for direct physical disturbance but will still be a relatively small proportion of the overall cSAC area. As outlined in earlier impact assessments, the habitats present within the Dogger Bank cSAC (VERs A, B and C) also exhibit a low sensitivity to suspended sediment concentrations and sediment deposition.

10.8.9. In terms of permanent habitat loss, Table 10.7 lists the permanent habitat loss from projects within the cSAC boundary (the proposed Dogger Bank Teesside

A & B, Dogger Bank Creyke Beck A & B and Dogger Bank Teesside C & D developments), amount to 27.43km$^2$, which equates to 0.22% of the overall cSAC.

Table 10.7 Permanent habitat loss from all projects within Dogger Bank cSAC

| **Project** | **Footprint of operational phase effects (permanent habitat loss) within cSAC boundary (via works in main site and Dogger Bank Teesside A & B Export Cable Corridors*)** | **Operational phase effect footprint as % of overall cSAC** |
|---|---|---|
| Dogger Bank Creyke Beck A | 3.94km$^2$ | 0.03% |
| Dogger Bank Creyke Beck B | 3.69km$^2$ | 0.02% |
| Dogger Bank Teesside A | 4.88km$^2$ | 0.03% |
| Dogger Bank Teesside B | 4.52km$^2$ | 0.03% |
| Dogger Bank Teesside C | 4.88km$^2$ | 0.03% |
| Dogger Bank Teesside D | 4.52km$^2$ | 0.03% |
| **TOTAL** | **27.43km$^2$** | **0.22%** |

* Only the footprint of effect within the parts of the Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A & B and Dogger Bank Teesside C & D Export Cable Corridors that lie within the cSAC boundary are listed here. The cable corridor "within the cSAC boundary" includes all of the export cable within the main zone and the small section outside the main zone but still within the SAC boundary.
** Values of habitat loss assumed, as EIA for Dogger Bank Teesside C & D not undertaken to date.

# 11. Transboundary Effects

11.1.1. This section of the chapter considers the potential for transboundary effects (effects across international boundaries) to occur on benthic and epibenthic resources as a result of the construction, operation or decommissioning of Dogger Bank Teesside A & B projects. For the purpose of this assessment, two types of transboundary effects are defined:

- i) those that might arise within the Exclusive Economic Zone (EEZ) of other European Community states; and
- ii) those that may arise on the interests of other European Community states, e.g. a non UK fishing vessel operating legitimately within UK waters.

11.1.2. With respect to the first type of potential transboundary effect, all impacts on the benthos during the construction, operation and decommissioning phases of all the projects (whether built in isolation or together), will be limited to direct habitat loss or disturbance caused by the placement of project infrastructure such as cables, foundations and scour protection and/or activity of vessels involved in the construction and operational phases (via jacking-up and anchoring) and indirect impacts due to the effect of increased suspended sediment concentration and sediment deposition.

11.1.3. Increased suspended sediment concentration created during the construction phase (due to cable and foundation installation) and operational phase (via sediment liberated as a result of scour effects) are noted to occur outside the site boundary. However the physical process modelling done on the worst-case scenario indicates that increased suspended sediment concentrations and sediment deposition do not impact non-UK waters. The areas that are affected outside the boundaries of Dogger Bank Teesside A & B are still located within UK territorial waters, albeit outside the main Dogger Bank Zone.

11.1.4. Therefore, there is no scope for direct or indirect transboundary impacts of type (i) listed above, i.e. impacts within the EEZ of other European Community states.

11.1.5. There is also no scope for transboundary impacts of type (ii) listed above, e.g. a non UK fishing vessel operating legitimately within UK waters. The impacts on benthic ecology within UK waters predicted as a result of this development (Dogger Bank Teesside A or Dogger Bank Teesside B in isolation or both built together) will not result in any wider impacts on activities, such as commercial fishing, that are undertaken by non UK vessels, in UK-waters.

11.1.6. A summary of the likely transboundary effects of Dogger Bank Teesside A & B can be found in **Chapter 32 Transboundary Effects**.

# 12. Summary

12.1.1. This chapter of the ES has provided a characterisation of the existing environment for marine and intertidal ecology based on both existing and site specific survey data, which has established that there will be some **negligible** and **minor adverse** residual impacts on marine ecology during construction, operation and decommissioning phases of Dogger Bank Teesside A & B.

12.1.2. The marine subtidal and intertidal habitats recorded across the main Dogger Bank Teesside A & B sites and Dogger Bank Teesside A & B Export Cable Corridors are typical for the central North Sea, with a range of biotopes recorded which have been grouped into nine VER's based on the sensitivity of the various biotopes.

12.1.3. Some of the subtidal benthic habitats correspond to the Annex I habitat "sandbanks slightly covered by seawater at all times" and lie within the boundary of the Dogger Bank cSAC. The sensitivity of the habitats identified within the study area to the impacts predicted via construction, operation and decommissioning of Dogger Bank Teesside A & B range from low to high, with the magnitude of effects generally negligible to low due to the small spatial extent of effect compared to the wider distribution of similar habitats.

12.1.4. This has resulted in the majority of impacts being assessed as **negligible** to **minor adverse**.

12.1.5. The impact assessment has also considered the potential for impacts on subtidal habitats that correspond to the boundary of the SAC (VERs A, B and C) to adversely affect the integrity of the Dogger Bank cSAC. Based on the assessment no such adverse effects are predicted. More details on the cSAC are provided in the **HRA Report**.

12.1.6. Due to the lack of significant impacts on marine subtidal or intertidal habitats, no specific mitigation is proposed and the monitoring proposals are typical of those for existing UK offshore wind farm projects, with a formal pre-construction baseline survey to be carried out in the future followed by a number of annual post-construction surveys. The design of these surveys will take account of the impact predictions made in the ES in order that the monitoring data can test the predictions of the ES.

12.1.7. **Table 12.1** provides a summary of the potential impacts on marine and intertidal ecology arising from the realistic worst case scenarios set out in **Table 5.1** earlier in the chapter.

## Table 12.1 Summary of predicted impacts of Dogger Bank Teesside A & B on marine and intertidal ecology

| Impacts | Mitigation | Residual impact |
|---|---|---|
| **Construction** | | |
| Physical disturbance to habitats and species and temporary habitat loss | None | **Negligible** impact on all VER apart from VER C<br><br>**Minor adverse** impact on VER C |
| Increased suspended sediment concentration and sediment deposition | None | **Negligible** impact on all VER apart from VER C<br><br>**Minor adverse** impact on VER C |
| Release of sediment contaminants resulting in potential effects on benthic ecology | None | **Negligible** impact on VERs A, B and C in wind farm sites (and furthest offshore part of the cable corridor)<br><br>**Minor adverse** impact on VERs D to I (cable corridor VERs) |
| Increased suspended sediment concentration leading to impacts on plankton and primary productivity | None | **Negligible** impact |
| Physical disturbance to intertidal habitats and species during landfall works | None | **Negligible** impact (VERs H and I) |
| Potential construction phase impacts on Dogger Bank cSAC | None | **Negligible** impact (VER A and B)<br><br>**Minor adverse** impact (VER C) |
| **Operation** | | |
| Permanent loss of habitat via placement of project infrastructure (foundations, cable protection, scour protection) | None | **Negligible** impact on VERs D, E, F, G, H and I<br><br>**Minor adverse** impact on VERs A, B and C |
| Temporary impact on benthos due to physical disturbance caused by maintenance activities | None | **Negligible** impact |
| Change in hydrodynamics and inter-related effects on benthos | None | **Negligible** impact |
| Increase in suspended sediment concentration due to scour associated with foundations | None | **Negligible** impact for all VERs apart from VER C<br><br>**Minor adverse** impact for VER C |
| Increase in sediment deposition following increase in suspended sediment concentration due to scour associated with foundations | None | **Negligible** impact |
| Introduction of new habitat in the form of foundation structures, leading to potential colonisation | None | **Negligible** impact |
| Effect of EMF on benthic communities | Where feasible cables will be buried to at least 1m | **Negligible** impact on all VERs |
| Potential operational phase impacts on Dogger Bank cSAC | None | **Negligible** impact (VER A and B)<br><br>**Minor adverse** impact (VER C) |

| Impacts | Mitigation | Residual impact |
|---|---|---|
| **Decommissioning** | | |
| Increased suspended sediment concentration and sediment deposition | None | **Negligible** impact |
| Loss of species colonising hard structures | None | **Negligible** impact |
| Temporary disturbance to habitats via removal of cables | None | **Negligible** impact on all VER apart from VER C<br><br>**Minor adverse** impact on VER C |
| Potential decommissioning phase impacts on the Dogger Bank cSAC | None | **Negligible** impact (VER A and B)<br><br>**Minor adverse** impact (VER C) |

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