Department for
Business, Energy
& Industrial Strategy

HORNSEA PROJECT THREE HABITATS REGULATION ASSESSMENT AND MARINE CONSERVATION ZONE ASSESSMENT

Regulation 63 of the Conservation of Habitats and Species Regulations 2017, and

Regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017

Section 125 of the Marine and Coastal Access Act 2009

June 2020

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1 Introduction

1.1 Background

This is a record of the Habitats Regulations Assessment ("HRA") and the Marine Conservation Zone assessment that the Secretary of State for Business, Energy and Industrial Strategy has undertaken under the Conservation of Habitats and Species Regulations 2017 ("the Habitats Regulations"), the Conservation of Offshore Marine Habitats and Species Regulations 2017 ("the Offshore Habitats Regulations") and the Marine and Coastal Access Act 2009 ("MACAA") in respect of the Development Consent Order ("DCO") and Deemed Marine Licences ("dMLs") for Hornsea Project THREE and its associated infrastructure (the "Project"). For the purposes of these Regulations the Secretary of State is the competent authority (under the Habitats Regulations and the Offshore Habitats Regulations) and the public authority (under the MACAA).

The Project will comprise of offshore wind turbines and offshore electrical platforms, and offshore and onshore export cables taking power to onshore electrical substations. The south western boundary of the wind turbine zone is approximately 121 km from the Norfolk Coast and occupies an area of approximately 696 km^2. The transmission cables will come ashore near Sheringham in Norfolk, and then run underground to the National Grid substation near Norwich. The Project application is described in more detail in Section 2.

The Project constitutes a nationally significant infrastructure project (NSIP) as defined by s.14(1)(a) of the Planning Act 2008 as it is for a generating station of over 100 MW.

The Project was accepted by the Planning Inspectorate ("PINS") on 8 June 2018 and a four-member Panel of Inspectors ("the Panel") was appointed as the Examining Authority ("ExA") for the application. The examination of the Project application began on 2 October 2018 and completed on 2 April 2019. The Panel submitted its report of the examination, including its recommendation ("the ExA's Report"), to the Secretary of State on 2 July 2019.

Following receipt of the ExA's report the Secretary of State requested further information relevant to this HRA on 27 September 2019 and 31 October 2019.

The Secretary of State's conclusions contained in this report have been informed by the ExA's Report, and further information and analysis, including the ExA's Report on the Implications for European Sites ("RIES") [PD-024] and written responses to it along with the written responses to the request made by the Secretary of State for further information (BEIS 2019) [1].

The report also contains analysis and assessment of the potential effects of the Project upon designated sites in other European Economic Area States ("transboundary sites"). This is included under the transboundary assessment section of the report (Section 7).

1.2 Habitats Regulations Assessment (HRA)

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive") and Council Directive 2009/147/EC on the conservation of wild birds ("the Birds

[1] BEIS (2019). *Request for information and comments on late representations received by the secretary of state, and notification of the secretary of state's decision to set a new date for determination of the application*. Letter dated 27 September 2019.

Directive") aim to ensure the long-term conservation of certain species and habitats by protecting them from possible adverse effects of plans and projects.

The Habitats Directive provides for the designation of sites for the protection of habitats and species of European importance. These sites are called Special Areas of Conservation ("SACs"). The Birds Directive provides for the classification of sites for the protection of rare and vulnerable birds and for regularly occurring migratory species within the EU. These sites are called Special Protection Areas ("SPAs"). SACs and SPAs are collectively termed European sites and form part of a network of protected sites across Europe. This network is called Natura 2000.

The Convention on Wetlands of International Importance 1972 ("the Ramsar Convention") provides for the listing of wetlands of international importance. These sites are called Ramsar sites. Government policy is to afford Ramsar sites in the United Kingdom the same protection as European sites.

In the UK, the Habitats Regulations and the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into national law as far as the 12nm limit of territorial waters. Beyond territorial waters, the Offshore Marine Habitats Regulations serve the same function for the UK's offshore marine area. The application covers areas within and outside the 12nm limit, so both sets of Regulations apply.

Regulation 63 of the Conservation of Habitats and Species Regulations 2017 provides that:

….before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which (a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in-combination with other plans or projects), and (b) is not directly connected with or necessary to the management of that site, [the competent authority] must make an appropriate assessment of the implications for that site in view of that site's conservation objectives.

And that: *In the light of the conclusions of the assessment, and subject to regulation 64 [IROPI], the competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).*

Regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017 contains similar provisions:

Before deciding to undertake, or give any consent, permission or other authorisation for, a relevant plan or project, a competent authority must make an appropriate assessment of the implications of the plan or project for the site in view of that site's conservation objectives.

And that:

In the light of the conclusions of the assessment, and subject to regulation 29 [IROPI], the competent authority may agree to the plan or project only if it has ascertained that it will not adversely affect the integrity of the European offshore marine site or European site (as the case may be).

This application is not directly connected with, or necessary to, the management of a European site or a European marine site. The Habitats Regulations require that, where the project is likely to have a significant effect ("LSE") on any such site, alone or in-combination with other plans and projects, an appropriate assessment ("AA") is carried out to determine whether or not the project will have an adverse effect on the integrity of the site in view of that site's Conservation Objectives. In this document, the assessments as to whether there are LSEs, and, where required, the AAs, are collectively referred to as the HRA.

This report was compiled using evidence from the application documents and consultation responses, which are available on the Planning Inspectorate's Nationally Significant Infrastructure Project web pages[2]. In particular:

- The ExA's Report
- The RIES
- The Applicant's ES
- The Applicant's Report to Inform the Appropriate Assessment
- Written responses to Secretary of State's request for further information

Plus other documents submitted during the Examination and during the course of the Secretary of State's consideration of the Application.

Key information from these documents is summarised and referenced in this report.

1.3 Marine Conservation Zone Assessment

Part 5 of the MACAA provides powers for Ministers to designate Marine Conservation Zones ("MCZs") alongside a duty to exercise this power to contribute to the creation of a network of Marine Protected Areas.

MCZs together with Special Areas of Conservation (under the Habitats Directive), Special Protection Areas (under the Wild Birds Directive), relevant parts of Ramsar sites and Sites of Special Scientific Interest, form an ecologically coherent network of Marine Protected Areas.

The MACAA seeks to protect and conserve MCZs through placing a series of duties on public authorities. These duties are linked to the conservation objectives which are contained in the designating order for each MCZ.

The Secretary of State as the public authority has duties contained in sections 125, 126 and 127 which can be summarised as follows:

- Section 125 – requires public authorities to exercise their functions in a manner to best further (or, if not possible, least hinder) the conservation objectives for MCZs.
- Section 126 - requires public authorities to consider the effect of proposed activities on MCZs before authorising them and imposes restrictions on the authorisation of activities that may have a significant risk of hindering the conservation objectives of an MCZ.
- Section 127 – provides that the SNCBs may give conservation advice in relation to MCZs to public authorities and are required to give that advice should an authority ask for it.

The duties are designed to provide MCZs with clear, flexible, proportionate and effective protection. The aim is to best achieve the conservation objectives for sites whilst not disproportionately impacting on the functions and efficiency of public authorities or, preventing necessary development which is in the public interest from taking place as long as there is compensation of equivalent environmental benefit.

The duties operate through the exercise of existing functions and consent regimes. They are intended to require public authorities and applicants to think more broadly and actively about how they carry out their existing functions and activities and, where feasible, to take positive measures to secure additional conservation gains.

[2] https://infrastructure.planninginspectorate.gov.uk/projects/eastern/hornsea-project-three-offshore-wind-farm/?ipcsection=docs

In assessing this application, the Secretary of State, as the public authority who will determine the application for authorisation, will assess any acts capable of affecting the protected features of an MCZ, or any ecological or geomorphological processes on which a feature depends, other than insignificantly. In undertaking this assessment, the Secretary of State must:

- Inform the Statutory Nature Conservation Body ("SNCB") if there is a significant risk of an act hindering an MCZ's conservation objectives and wait 28 days before deciding whether to grant the authorisation, except where the SNCB notifies the public authority that there is no need to wait or if the situation is urgent.
- Not grant authorisation unless satisfied that either:

(a) there is no significant risk of hindering the conservation objectives, or

(b) that (i) there is no other means of proceeding with the act which would create a substantially lower risk of hindering the MCZ's conservation objectives, and (ii) the benefit to the public clearly outweighs the risk of damage to the environment and (iii) measures of equivalent environmental benefit to the damage will be undertaken

- Have regard to advice from the SNCB.

The Secretary of State considered impacts from the Project on MCZ in Section 8 of this Report.

1.4 RIES and Statutory Consultation

Under the Habitats Regulations and the Offshore Habitats Regulations the competent authority must, for the purposes of an AA, consult the appropriate nature conservation body and have regard to any representation made by that body within such reasonable time as the authority specifies.

Natural England ("NE") is the Statutory Nature Conservation Body ("SNCB") for England and for English waters within the 12 nm limit. The Joint Nature Conservation Committee ("JNCC") is the SNCB beyond 12 nm, but this duty has been discharged by NE following the 2013 Triennial Review of both organisations (Defra, 2013). However, JNCC retains responsibility as the statutory advisor for European Protected sites that are located outside the territorial sea and UK internal waters (i.e. more than 12 nautical miles offshore) and as such, continues to provide advice to NE on the significance of any potential effects on interest features of such sites.

The ExA prepared a RIES, with support from the Planning Inspectorate's Environmental Services Team [PD-024]. The RIES was based on matrices provided by the Applicant and relevant information provided by Interested Parties. The RIES documented the information received during the examination (up until 8 February 2019) and presented the ExA's understanding of the main facts regarding the HRA to be carried out by the Secretary of State.

The RIES was published on PINS planning portal website and the ExA notified Interested Parties that it had been published. Consultation on the RIES was undertaken between 21 February 2019 and 14 March 2019. The RIES was issued to ensure that Interested Parties, including the SNCBs, were consulted formally on habitat regulations matters, as required under regulation 63(3) of the Habitats Regulations and regulation 28(4) of the Offshore Habitats Regulations.

The Secretary of State is content to accept the ExA's recommendation that the RIES, and consultation on it, represents an appropriate body of information to enable the Secretary of State to fulfil his duties in respect of European sites.

2 Development description

Figure 1 shows the Project location in the southern North Sea. The array area of the project occupies approximately 696 km^2 and is around 121 km from the Norfolk coast.

At the time of Examination the Development would comprise:

- an electrical capacity above 100 MW and up to 2.4 GW;
- up to 300 wind turbines
- up to three offshore accommodation platforms;
- up to twelve offshore transformer substations;
- up to four offshore High Voltage Direct Current ("HVDC") converter substations, or up to six subsea offshore High Voltage Alternating Current ("HVAC") booster stations and up to four surface offshore HVAC booster stations;
- subsea inter-array electrical circuits;
- a marine connection to shore;
- a foreshore connection;
- an onshore connection to an onshore substation; and
- the connection to National Grid's existing Norwich Main substation.

Subsequent to Examination and in response to a request for information by the Secretary of State the Applicant has submitted post-examination design envelope modifications including a reduction in the number of turbines from a maximum of 300 to a maximum of 231 (Ørsted 2020) [3]. This and other relevant modifications to the design envelope proposed in the post-examination modifications will be secured through the DCO.

2.1 Construction Program

The final construction programme will be submitted to the Marine Management Organisation ("MMO") under condition 13(1)(b) of the generation assets deemed marine licence and condition 14(1)(b) of the transmission assets deemed marine licence in the draft DCO. The construction programme must include details of a proposed construction start date; proposed timings for mobilisation of plant delivery of materials and installation works; and an indicative written construction programme for all wind turbine generators, offshore accommodation platforms, electrical installations and electrical circuits and cable comprised in the works at paragraphs 2(f) and 3(a) to 3(c) of Part 1 (licenced marine activities) of the Deemed Marine Licence.

[3] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020

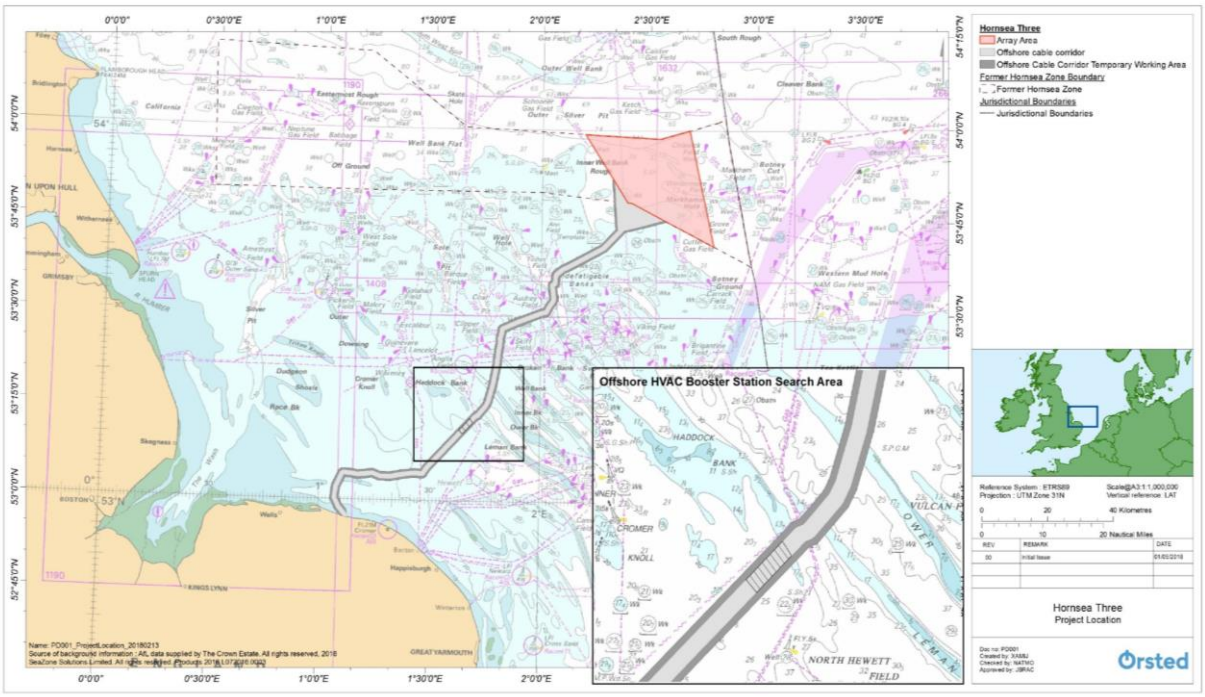

Figure 1: Proposed location of the Project (offshore works).

Figure 2 shows the onshore cable corridor connecting the foreshore connection to the National Grid substation.

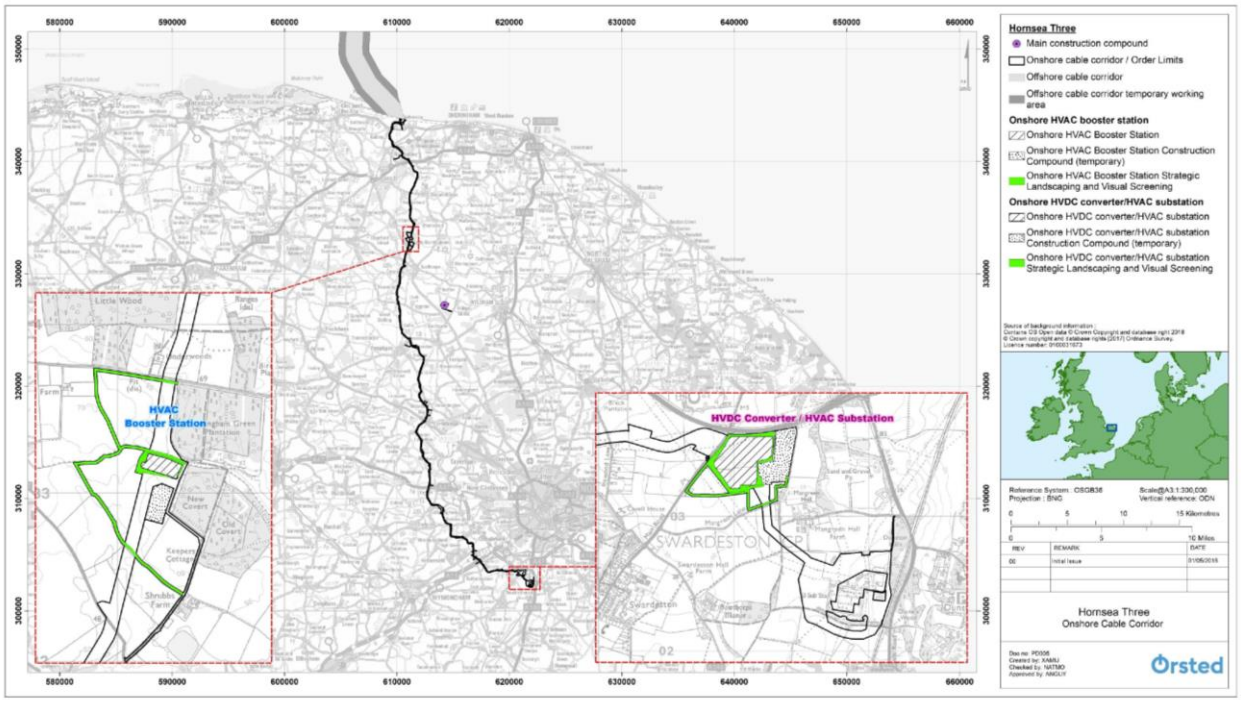

Figure 2: Proposed location of the Project (onshore works).

3 Likely Significant Effects Test

Under regulation 63 of the Habitats Regulations and regulation 28 of the Offshore Habitats Regulations, the Secretary of State must consider whether a development will have a LSE, either alone or in combination with other plans or projects on each of the interest features of the European sites identified in the RIES to determine whether or not significant effects are likely.

The purpose of this section is to identify any LSEs on European sites and to record the Secretary of State's conclusions on the need for an AA and his reasons for including activities, sites or plans and projects for further consideration in the AA.

Of all the European sites identified during Examination, the ExA concluded that significant effects were likely for 14 sites and their qualifying features either alone or in-combination [PD-024]:

- Berwickshire and North Northumberland Coast SAC
- Coquet Island SPA
- Farne Islands SPA
- Forth Islands SPA
- Flamborough and Filey Coast SPA
- Greater Wash SPA
- Humber Estuary SAC and Ramsar site
- Norfolk Valley Fens SAC
- North Norfolk Coast SAC
- North Norfolk Coast SPA/Ramsar site
- North Norfolk Sandbanks and Saturn Reef SAC
- River Wensum SAC
- The Southern North Sea SAC
- The Wash and North Norfolk Coast SAC

For each designated site, Table 1 summarises the features for which significant effects, either alone or in combination, cannot be excluded. The ExA report and the RIES provide further information on sites and features which were considered but for which there is not likely to be a significant effect.

The Secretary of State notes that Natural England raised concerns about the approach the Applicant took in determining LSE whereby interactions that are deemed to not have a significant LSE alone, were not carried forward into an in-combination assessment of combined residual effects [REP1-213]. Also, Natural England [RR-097], RSPB [RR-113] and the MMO [RR-085] considered that an appropriate, site specific ornithological baseline has not been established. Natural England were therefore unable to confirm that a complete list of features and European sites had been captured in the RIAA [APP-052].

The sites and features on which Natural England disagreed with the Applicant's assessment of LSE were the:

- Greater Wash SPA and North Norfolk Coast SPA: common tern and little gull; and
- Farne Islands SPA, Coquet Island SPA and Forth Islands SPA: auk species.

While, on this point, the Secretary of State has adopted the conclusions of the RIES, he notes that the issues above received a high level of attention during the Examination. As such, the Secretary of State has considered these matters in detail, below.

3.1 Greater Wash SPA and North Norfolk Coast SPA

The Applicant considered there was no potential for LSE on the common tern feature of either the Greater Wash SPA or the North Norfolk Coast SPA and therefore concluded that there would be no potential for an in combination effect [REP4-081]. NE and the ExA do not agree with this conclusion because whilst it might not be an important feeding area, connectivity is nevertheless present and consequently the impact would not be *de minimus* [REP-212].

The Secretary of State does not agree with the ExA on this point as demonstrating connectivity between a potential effect and a qualifying feature does not automatically demonstrate an LSE. Although there may be overlap in the foraging area of common tern and the export cable route, the Applicant has concluded that common tern has a low vulnerability to any potential displacement impact and consequently no LSE. The Secretary of State agrees with the Applicant on this point and concludes that there is no LSE from the project alone or in-combination.

Natural England disputed the Applicant's conclusion that there was no LSE for the little gull qualifying feature of the Greater Wash SPA [REP7-065]. It highlighted a potential impact pathway because this species was included in the migratory collision risk modelling [APP-109]. The Secretary of State agrees with the ExA's conclusions that little gull shows a low vulnerability to wind turbines [REP4-042] and that the collision risk is less than one individual per annum. The Secretary of State therefore concludes that there is no LSE from the project alone or in combination.

3.2 Farne Islands SPA, Coquet Island SPA and Forth Islands SPA

Natural England considered that LSE from barrier effects cannot be ruled out for guillemot, razorbill and puffin qualifying features at Coquet Island and Farne Islands SPAs as well as potential kittiwake collision mortality for kittiwake at the Farne Islands SPA [REP7-065].

Whilst Natural England does not consider the Applicant's approach to identifying LSE is robust and may have led to sites not being considered, the ExA does not share this view.

The ExA consider that the LSE assumptions provided by the Applicant in the RIAA are based on a pragmatic range of attributes that account for mobile species at different times of the year.

The ExA note that Natural England was unable to conduct its own screening exercise [REP1-212] and the fact that no additional sites, other than those listed in Table 3.1 of the RIES [PD-024], have been suggested by any Interested Parties.

The Secretary of State agrees with the ExA that given the lack of supporting empirical evidence provided by any Interested Parties (including Natural England), there will not be LSEs from barrier effects for guillemot, razorbill and puffin at Coquet Island and Farne Islands SPAs or potential LSEs from kittiwake collision mortality for kittiwake at the Farne Islands SPA .

3.3 LSE Assessment Methodology

Natural England does not agree with the Applicant's approach to identifying LSE and consider it may have led to sites not being considered. However, the Secretary of State agrees with the ExA and the Applicant that the screening criteria listed in the RIAA [APP-052] are based on a pragmatic range of attributes that account for mobile species at different times of the year. Furthermore, Natural England did not provide an alternative screening exercise and no additional European sites were provided by any interested parties.

Given the above, and in the absence of substantiated evidence to the contrary, the Secretary of State concludes that there would be no significant in combination effects to justify an Appropriate Assessment

of potential impacts on the additional qualifying features (discussed above) for which Natural England has raised concerns.

3.4 Ornithological Baseline

Relevant representations from Natural England [RR-097], RSPB [RR-113] and the MMO [RR-085] considered that an appropriate, site specific ornithological baseline has not been established as a minimum of two years data are necessary to account for variability in bird numbers. The Applicant undertook a site specific digital aerial survey during 2016 and 2017 resulting in only one winter season of data being collected between December and March (rather than the two seasons Natural England consider as best practice).

The Applicant sought to address this issue by incorporating historical boat-based survey data from the Hornsea Zone Study Area. Natural England maintained that this level of coverage is not sufficient for baseline characterisation because the abundance and distribution of birds is site specific.

Subsequent to the examination the Applicant submitted further ornithological data obtained from aerial digital surveys during January (one survey), February (two surveys) and March 2019 (one survey)(Ørsted 2019)[4]. Inclusion of the supplementary data into the existing baseline data for that period was shown to make no material difference to the conclusions made in original assessment nor those relating to the LSE test. In response Natural England have advised that that the intention is for surveys to be undertaken concurrently, over a minimum of 24 months, whereas surveys undertaken across multiple years reduces confidence in the data set. It is known that there are natural inter-annual population differences which are likely to skew the datasets, hence the need for concurrent surveys over more than one consecutive year. Although the additional information increases the survey coverage, there remains only one December count, which will affect both displacement and collision estimates. Based on the original December to March dataset for 2016-17, December was the month of peak occurrence in this period for kittiwake, gannet, herring gull, guillemot, razorbill and fulmar (Natural England 2020) [5].

The Secretary of State has considered the supplementary information and considers that the additional data do not change the conclusions made in the RIAA [APP-052]. The Secretary of State agrees with the ExA's conclusion that despite the potential inconsistency in the ornithological data, the LSE test does not require absolute certainty and decisions are often necessary on the basis of imperfect evidence.

Therefore, the Secretary of State agrees with the conclusions of the ExA regarding the European sites and features for which there is a LSE and considers that the correct potential impacts and relevant features for which there is a LSE is presented in Table 1 (as per Table 3.1 of the RIES [PD-024]).

Table 1: European sites for which significant effects cannot be excluded, when the Project is considered alone or in combination with plans or projects, on the listed qualifying features (summarised from the ExA's Report and the RIES).

Name of European Site	Features for which likely significant effects have been identified
Berwickshire and North Northumberland Coast SAC	Grey Seal
Coquet Island SPA	Part of assemblage qualifying feature: fulmar
Farne Islands SPA	Part of assemblage qualifying feature: fulmar

[4] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

[5] Natural England (2020). *Hornsea Project Three – Applicant's submission to Secretary of State Consultation Request for further information*. 22 April 2020.

Name of European Site	Features for which likely significant effects have been identified
Forth Islands SPA	Part of assemblage qualifying feature: fulmar
Flamborough and Filey Coast SPA	Breeding population & part of seabird assemblage qualifying features: gannet
	Breeding population & part of seabird assemblage qualifying features: kittiwake
	Part of assemblage qualifying feature: herring gull
	Breeding population & part of assemblage qualifying feature: puffin
	Breeding population & part of seabird assemblage qualifying features: guillemot
	Breeding population & part of seabird assemblage qualifying features: razorbill
	Part of assemblage qualifying feature: fulmar
Greater Wash SPA	Breeding population: Sandwich tern
	Non-breeding: red-throated diver
	Migratory species: common scoter
Humber Estuary SAC and Ramsar site	River lamprey
	Sea lamprey
	Grey seal
North Norfolk Coast SAC	Coastal lagoons
	Perennial vegetation of stony banks
	Mediterranean and thermos-Atlantic halophilous scrub
	Embryonic shifting dunes
	Shifting dunes along the shoreline with *Ammophila arenaria*
	Fixed coastal dunes (grey dunes)
	Humid dune slacks
	Otter
	Petalwort
	Pink-footed goose (non-breeding)
North Norfolk Coast SPA/Ramsar site	Ramsar criterion 1 – one of the largest expanses of undeveloped coastal habitat in Europe
	Ramsar criterion 2 – supports at least 3 Red Data Book and 9 nationally scarce vascular plants, one British Red Book lichen and 38 British Red Data Book invertebrates
	Ramsar criterion 5 – overwintering bird assemblage
	Ramsar criterion 6 – passage population of knot, over-wintering population of dark-bellied Brent goose, knot, pink-footed goose, pintail and wigeon
Norfolk Valley Fens SAC	Alkaline fens
	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae
	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
	European dry heaths

Name of European Site	Features for which likely significant effects have been identified
	Molinia meadows with calcareous, peaty or clayey-silt laden soils
	Northern Atlantic wet heaths
	Semi-natural dry grasslands and scrubland facies
	Narrow-mouthed whorl snail
North Norfolk Sandbanks and Saturn Reef SAC	Sandbanks which are slightly covered by water all the time
	Reefs
River Wensum SAC	Watercourses of plain to montane levels
	Desmoulin's whorl snail
	White-clawed crayfish
	Brook lamprey
	Bullhead
The Southern North Sea SAC	Harbour porpoise
The Wash and North Norfolk Coast SAC	Sandbanks which are slightly covered by seawater all the time
	Reefs
	Harbour seal
	Otter

The Secretary of State has considered the potential effects of the application on all relevant interest features, taking into account their conservation objectives, on existing protected sites including the 14 protected sites listed above to determine whether there will be LSEs in the context of the Habitats Regulation and the Offshore Habitats Regulations. The Secretary of State recognises that powers are in place for decommissioning effects to be addressed fully by the relevant authorities prior to decommissioning, and in light of more detailed information on decommissioning processes and environmental conditions at that time. The Secretary of State therefore considers that it is reasonable not to include a detailed discussion on decommissioning effects in this report and notes that decommissioning is not a barrier to the application being granted.

3.5 Likely Significant Effects alone assessment

The Secretary of State agrees with the recommendations of the ExA and concludes that likely significant effects cannot be excluded at the 14 sites listed in Table 1, when the Project is considered alone.

These sites are taken forward to the AA to consider whether the Project will result in an adverse effect upon the integrity of these sites.

3.6 Likely Significant Effects in-combination assessment

Under the Habitats Regulations and the Offshore Habitat Regulations, the Secretary of State is obliged to consider whether other plans or projects in-combination with the Project might affect European sites. In this case there are a number of other plans or projects which could potentially affect some of the same European sites. The approach used by the Applicant to assess in combination effects was to select projects which may affect the designated site feature under consideration. The plans or projects included in the in combination assessment include a number of planned and existing offshore wind farms within the vicinity of the Project and a number of projects expected to affect coastal and terrestrial habitats, for example works to extract aggregates, or lay cables or pipelines.

The Secretary of State agrees with the recommendations of the ExA and concludes that LSEs cannot be excluded at the 14 sites listed in Table 1 when the impacts of the Project are considered in-combination with other plans or projects. The Examination did not identify any other European sites in which LSEs could not be excluded.

The 14 sites listed above are taken forward to the AA to consider whether the Project in combination with other plans or projects will result in an adverse effect upon the integrity of these sites.

4 Appropriate Assessment Methodology

The purpose of this AA is to determine whether or not adverse effect on the integrity of the features of the 14 sites identified can be ruled out as a result of the application alone or in combination with other plans and projects in view of the site's conservation objectives and using the best scientific evidence available.

If the competent authority cannot ascertain the absence of an adverse effect on integrity within reasonable scientific doubt, then under the Habitats Regulations, alternative solutions should be sought. In the absence of an acceptable alternative, the project can proceed only if there are imperative reasons of overriding public interest ("IROPI") and suitable compensation measures identified.

4.1 Conservation objectives

Guidance from the European Commission indicates that disturbance to a species or deterioration of a European site must be considered in relation to the integrity of that site and its conservation objectives (European Commission, 2019)[6]. Section 4.6.4 of that guidance defines site integrity as:

…the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated.

Conservation objectives outline the desired state for a European site, in terms of the interest features for which it has been designated. If these interest features are being managed in a way which maintains their nature conservation value, they are assessed as being in a 'favourable condition'. An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of its designation.

Conservation objectives have been used by the Secretary of State to consider whether the Project has the potential for having an adverse effect on integrity, either alone or in-combination on European Sites. The potential for the Project to have an adverse effect on site integrity is next considered for each site in turn.

4.2 Appropriate Assessment: European sites on which the Applicant and SNCBs agree no Adverse Effect on Integrity

Table 1 sets out the 14 sites and associated features for which the Secretary of State considers there will be a potential adverse effect on integrity. The Applicant's conclusions were disputed by interested parties in relation to the following sites:

- Coquet Island SPA,
- Farne Islands SPA,
- Flamborough and Filey Coast SPA,
- Greater Wash SPA,
- North Norfolk Coast SPA/Ramsar Site,

[6] European Commission (2019). *Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC.* Commission Notice C(2018) 7621 final, Brussels, 21.11.2018.

- North Norfolk Sandbanks and Saturn Reef SAC,
- River Wensum SAC,
- The Southern North Sea SAC,
- The Wash and North Norfolk Coast SAC,

Table 2 provides the reasons that the Applicant, with agreement from SNCBs (as shown in the RIES Table 4.1), considers that there would not be an adverse effect on the integrity of the remaining six sites.

Table 2: European sites for which the Applicant and SNCBs agree[7] there is no adverse effect on integrity from the Project either alone or in combination.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
Berwickshire and North Northumberland Coast SAC	Grey seal	Construction/ Decommissioning	Underwater noise from foundation installation and UXO clearance (construction). Increased vessel traffic and collision risk. Accidental pollution events.	The site is located approximately 266 km from the Project's array/cable area. The maximum Permanent Threshold Shift ("PTS") range from foundation installation for seals is estimated as 41 m (based on underwater noise modelling[9]). This coupled with the adoption of standard mitigation such as the use of an Acoustic Deterrent Device ("ADD") as per JNCC piling protocol[10] means the risk of mortality or injury from foundation installation is considered negligible. Noise modelling and at-sea usage density data was also used to estimate the potential displacement from foundation installation. Distribution of grey seals has been shown to return to normal in less than two hours after pile-driving[11]. Given the above, there is no indication that behavioural effects associated with underwater noise on the grey seal qualifying feature of this site would result in a permanent shift in the population or the distribution of the feature within this SAC in the long term. Impacts from UXO clearance were also estimated using underwater noise modelling and at-sea population density data. Worst case estimates were an impact area of 10.18 km^2 and with less than 1 individual likely affected, coupled with standard injury

[7] As shown in table 4.1 of the RIES [PD-024]

[8] Conservation Objectives for each site can be found in section 6.2 of the RIAA

[9] Table 6.12 of the RIAA

[10] http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Piling%20protocol_August%202010.pdf

[11] Russell, D.J., Hastie, G.D., Thompson, D., Janik, V.M., Hammond, P.S., Scott-Hayward, L.A., Matthiopoulos, J., Jones, E.L., and McConnell, B.J. (2016). Avoidance of wind farms by harbour seals is limited to pile driving activities. *Journal of Applied Ecology*.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				mitigation measures (i.e. ADD use and pre-charge explosions) makes the likelihood of adverse effects on the integrity of grey seals negligible. Disturbance from vessel noise is likely to occur only where increased noise from vessel movements associated with the construction of the Project is greater than the background ambient noise level. The Greater Wash is a relatively busy shipping area, therefore background noise levels are likely to be high. There is a high likelihood of avoidance from both increased vessel noise and collision risk, with both a high potential for recovery (< 1 year) for increased noise, and medium potential for recovery for collision risk (reflecting the low likelihood of collision and potential for non-lethal collision to occur). While the recovery from vessel disturbance is dependent on the number of vessels present during the operational phase, operational phase vessels are likely to be smaller and consequently disturbance and collision risk are considered to be reduced. Between the construction phases, vessel presence will reduce, with fewer operational vessels required than the maximum assessed (fewer structures will require proportionally fewer operational visits) and during the second phase of construction, it is likely that vessels may undertake joint construction and operational activities while on site, reducing the combined vessel movements required. The potential sources of pollution during the construction phase include vessel movements, use of drilling muds and storage of chemicals including lubricants, coolant, hydraulic oil and fuel on offshore platforms. The magnitude of the impact is dependent on the nature of the pollution incident but the Strategic Environmental Assessment (SEA) carried out by DECC (2011) recognised that, “renewable energy developments have a generally limited potential for accidental loss of containment of

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				hydrocarbons and chemicals, due to the relatively small inventories contained on the installations (principally hydraulic, gearbox and other lubricating oils, depending on the type of installation)". Any spill or leak within the offshore regions of Hornsea Three would be immediately diluted and rapidly dispersed. Based on the information presented above, there is no indication that effects associated with increased vessel traffic would result in a permanent shift in the population or the distribution of the grey seal feature within this SAC in the long term and subsequently no adverse effect on the population or distribution of this qualifying feature is anticipated
		Operation	Increased vessel traffic and collision risk. Accidental pollution events.	Increased vessel traffic and collision risk is discussed in the construction/decommissioning section above. The impacts and likelihood of adverse effects from the operational phase of the Project is considered to be the same as the construction/decommissioning phase, therefore, no adverse effect on integrity is predicted. As per the construction phase, the potential sources of pollution during the operation include vessel movements, use of drilling muds and storage of chemicals including lubricants, coolant, hydraulic oil and fuel on offshore platforms. The magnitude of the impact is dependent on the nature of the pollution incident but the Strategic Environmental Assessment (SEA) carried out by DECC (2011) recognised that, "*renewable energy developments have a generally limited potential for accidental loss of containment of hydrocarbons and chemicals, due to the relatively small inventories contained on the installations (principally hydraulic, gearbox and other lubricating oils, depending on the type of installation)*". Any spill or leak within the offshore regions

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				of Hornsea Three would be immediately diluted and rapidly dispersed. Marine mammals are likely to avoid any minor events and therefore are of low vulnerability with the potential for high recoverability. Based on the above, there is no indication that effects associated with accidental pollution events would lead to a reduction in the extent or structure and function of the habitats of the qualifying species or the supporting processes on which this species rely. On this basis there is no indication of an adverse effect on the Annex II qualifying feature of this SAC.
Forth Islands SPA	Fulmar (breeding, post-breeding, non-breeding and pre-breeding seasons)	Operation	Displacement.	The Project lies within the mean maximum foraging range of fulmar (400 ± 245.8 km[12]) from the Forth Islands SPA. Fulmar is not a qualifying feature in its own right but is listed as a main component of the seabird assemblage at the Forth Islands SPA with a population of 798 breeding pairs as detailed in the SPA citation. Assuming that the contribution of a breeding colony to the population of fulmar present in the Project Area is related to the size of the breeding population, the proportion of fulmar present in the Project Area that originate from the breeding population at the Forth Islands SPA is 11.5%. For the post-and pre-breeding seasons (autumn and spring) the Biologically Defined Minimum Population Scale (BDMPS)

[12] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S., Roos, S., Bolton, M., Langston, R.H. and Burton, N.H. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, 156, p. 53-61.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				population from Furness (2015)[13] is 957,502 individuals of which 0.17% are from the colony at the Forth Islands SPA. In the non-breeding season (winter), the BDMPS population is an estimated 568,736 individuals[14] of which 0.20% are from the colony at Forth Islands SPA. The mean-peak fulmar population estimate within the Project Area during the breeding season that can be apportioned to the Forth Islands SPA is 164 birds. Displacement analysis for fulmar predicts mortality of up to one fulmar in the breeding season based on a displacement rate range of 10-30% and a mortality rate of 2%. Therefore, birds lost to the population as a result of displacement represent 0.02-0.06% of the SPA breeding population (798 pairs) and would result in a 0.32-0.96% increase in background mortality (102 individuals). The mean-peak fulmar population estimate calculated for Hornsea Three and 2 km buffer during all three non-breeding seasons that can be apportioned to the Forth Islands SPA is two birds in the post-breeding season and one bird in the non- and pre-breeding seasons. When applying a displacement rate range of 10-30% and a mortality rate of 1%, the displacement mortality in each of these seasons is less than one bird. As such, there is considered to be no impact on the SPA as a result of displacement in these seasons. Due to the negligible proportion of the Forth Islands pSPA population affected by displacement and, the insignificant increase in background mortality it is assessed that there is no

[13] Furness, R.W. (2015) Non-breeding season populations of seabirds in UK waters. Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report NECR164.

[14] Furness, R.W. (2015) Non-breeding season populations of seabirds in UK waters. Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report NECR164.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				adverse effect on the integrity of the fulmar population of the Forth Islands pSPA as a result of displacement mortality due to operation and maintenance activities.
Humber Estuary SAC/Ramsar	Grey seal	Construction/ Decommissioning	Underwater noise from foundation installation and UXO clearance (construction). Increased vessel traffic and collision risk. Accidental pollution events.	The site is located approximately 74 km from the Project's array/cable area. The maximum Permanent Threshold Shift ("PTS") range from foundation installation for seals is estimated as 41 m (based on underwater noise modelling[15]). This coupled with the adoption of standard mitigation such as the use of an Acoustic Deterrent Device ("ADD") as per JNCC piling protocol[16] means the risk of mortality or injury from foundation installation is considered negligible. Noise modelling and at-sea usage density data was also used to estimate the potential displacement from foundation installation was a worst case of approximately 0.1% of the grey seal reference population. Distribution of grey seals has been shown to return to normal in less than two hours after pile-driving[17]. Given the above, there is no indication that behavioural effects associated with underwater noise on the grey seal qualifying feature of this site would result in a permanent shift in the population or the distribution of the feature within this SAC in the long term. Impacts from UXO clearance were also estimated using underwater noise modelling and at-sea population density data. Worst case estimates were an impact area of 10.18 km^2 and with

[15] Table 6.12 of the RIAA

[16] http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Piling%20protocol_August%202010.pdf

[17] Russell, D.J., Hastie, G.D., Thompson, D., Janik, V.M., Hammond, P.S., Scott-Hayward, L.A., Matthiopoulos, J., Jones, E.L., and McConnell, B.J. (2016). Avoidance of wind farms by harbour seals is limited to pile driving activities. Journal of Applied Ecology.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				less than 1 individual likely affected, coupled with standard injury mitigation measures (i.e. ADD use and pre-charge explosions) makes the likelihood of adverse effects on the integrity of grey seals negligible. Disturbance from vessel noise is likely to occur only where increased noise from vessel movements associated with the construction of the Project is greater than the background ambient noise level. The Greater Wash is a relatively busy shipping area, therefore background noise levels are likely to be high. There is a high likelihood of avoidance from both increased vessel noise and collision risk, with both a high potential for recovery (< 1 year) for increased noise, and medium potential for recovery for collision risk (reflecting the low likelihood of collision and potential for non-lethal collision to occur). While the recovery from vessel disturbance is dependent on the number of vessels present during the operational phase, operational phase vessels are likely to be smaller and consequently disturbance and collision risk are considered to be reduced. Between the construction phases, vessel presence will reduce, with fewer operational vessels required than the maximum assessed (fewer structures will require proportionally fewer operational visits) and during the second phase of construction, it is likely that vessels may undertake joint construction and operational activities while on site, reducing the combined vessel movements required. Based on the information presented above, there is no indication that effects associated with increased vessel traffic would result in a permanent shift in the population or the distribution of the grey seal feature within this SAC in the long term and subsequently no adverse effect on the population or distribution of this qualifying feature is anticipated

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
		Operation	Increased vessel traffic and collision risk. Accidental pollution events.	Increased vessel traffic and collision risk is discussed in the construction/decommissioning section above. The impacts and likelihood of adverse effects from the operational phase of the Project is considered to be the same as the construction/decommissioning phase, therefore, no adverse effect on integrity is predicted. The potential sources of pollution during the construction phase include vessel movements, use of drilling muds and storage of chemicals including lubricants, coolant, hydraulic oil and fuel on offshore platforms. The magnitude of the impact is dependent on the nature of the pollution incident but the Strategic Environmental Assessment (SEA) carried out by DECC (2011) recognised that, “renewable energy developments have a generally limited potential for accidental loss of containment of hydrocarbons and chemicals, due to the relatively small inventories contained on the installations (principally hydraulic, gearbox and other lubricating oils, depending on the type of installation)”. Any spill or leak within the offshore regions of Hornsea Three would be immediately diluted and rapidly dispersed. Marine mammals are likely to avoid any minor events and therefore are of low vulnerability with the potential for high recoverability. Based on the above, there is no indication that effects associated with accidental pollution events would lead to a reduction in the extent or structure and function of the habitats of the qualifying species or the supporting processes on which this species rely. On this basis there is no indication of an adverse effect on the Annex II qualifying feature of this SAC.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
Norfolk Valley Fens SAC	Alkaline fens (Calcium-rich springwater-fed fens). Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (Alder woodland on floodplains) Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*. (Calcium-rich fen dominated by great fen sedge (saw sedge)). European dry heaths. Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*). (Purple moor-grass meadows).	Construction/ Decommissioning	Permanent habitat loss. Temporary disturbance/damage. Accidental pollution. Invasive non-native species.	The nearest fen within the Norfolk Valley Fens SAC to the onshore cable corridor is Booton Common SSSI. The onshore cable corridor is 280 m from the Norfolk Valley Fens SAC with greater distances to permanent infrastructure. Access routes are located approximately 200 m from the Norfolk Valley Fens SAC at Booton Common. The Applicant undertook surveys which indicated that the following Annex I habitats do not occur where the Hornsea Three onshore cable corridor is likely to impact the Norfolk Valley Fens SAC: • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*; • Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*; European dry heath; Molinia meadows on calcareous, peaty or clayey-silt-laden soils; Northern Atlantic wet heaths with *Erica tetralix*; and Semi-natural dry grasslands and scrubland facies: on calcareous substrates. As a result of the spatial separation, no adverse effect on site integrity will occur with respect to the above listed Annex I habitats for any of the likely significant effects during construction/decommissioning and/or operation and maintenance. Design measures such as Horizontal Directional Drilling (“HDD”) to avoid disturbing drains, and using hydrology characterisation to avoid damaging ground water flows and hydrologically linked features will mean the buried export cable will have no adverse effect on site integrity with respect to the extent, distribution, structure and function of alkaline fens (calcium-rich springwater-fed fens) or to the supporting (physical, chemical or biological) process on which the habitats rely.

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
	Northern Atlantic wet heaths with *Erica tetralix* (Wet heathland with cross-leaved heath). Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco-Brometalia*) (Dry grasslands and scrublands on chalk or limestone). Narrow-mouthed whorl snail *Vertigo angustior*			The mitigation measure above will also avoid any temporary disturbance or damage to the same features. Details of the pollution control measures proposed are provided in the ES[18] which accompanies the application. Measures to be taken during HDD in relation to handling of bentonite and the requirement for plans to be produced for HDD beneath watercourses (to minimise the risk of pollution) are included in the Outline Code of Construction Practice ("CoCP"). Where practicable, the location of the start and end point of the HDD operation will be carefully selected to ensure that trenching up to the HDD locations will minimise the risk of run-off from trenching reaching hydrologically sensitive features. These proposed design measures will avoid accidental pollution and the application of pollution control measures will minimise the risk to this Annex I habitat. To minimise the risk of spreading invasive species to, from or within the SAC, works will be carried out in accordance with a biosecurity protocol documented in the Outline CoCP. An Ecological Clerk of Works will be employed during construction to ensure compliance. The proposed application of a biosecurity protocol will minimise the risk of introducing or spreading invasive non-native plant or animal species within the site. Within the spatial overlap of the cable corridor and the SAC, narrow-mouthed whorl snail and Desmoulin's whorl snail are known to occur at Booton Common, however surveys for both species undertaken in 2017[19] found no individuals. Therefore, no adverse effect on site integrity will occur with respect to the extent and distribution of the Annex II species and

[18] Volume 3, chapter 2: Hydrology and Flood Risk and in the Outline Code of Construction Practise

[19] Environmental Statement: Volume 6, annex 3.3: Desmoulin's Whorl Snail Survey

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
				the extent, distribution, structure and function of their supporting habitats.
		Operation	Temporary disturbance/damage. Accidental pollution. Invasive non-native species.	The mitigation measures and practices employed to avoid adverse effect in the construction/decommissioning phase (above) will mostly be relevant for the operation phase of the Project. A biosecurity protocol will be included in the Environmental Management Plan which will ensure all maintenance equipment, vehicles and personal follow best practice to prevent contamination from non-native species. Therefore, no adverse effect on site integrity will occur with respect to a change in extent, distribution, structure and function of alkaline fens (calcium-rich springwater-fed fens) or to the supporting (physical, chemical or biological) processes on which the habitats rely.
North Norfolk Coast SAC	Coastal lagoons. Fixed dunes with herbaceous vegetation (grey dunes). (Dune grassland). Embryonic shifting dunes. Humid dune slacks. Mediterranean and thermo-Atlantic	Construction/ Decommissioning	Permanent habitat loss. Temporary disturbance/damage. Accidental pollution. Invasive non-native species.	The site contains a large, active series of dunes on shingle barrier islands and spits and is little affected by development. The exceptional length and variety of the dune/beach interface is reflected in the high total area of embryonic dune. Sand couch *Elytrigia juncea* is the most prominent sand-binding grass. The site supports a large area of shifting dune vegetation, which is also varied but dominated by marram grass *Ammophila arenaria*. The fixed dunes are rich in lichens and drought-avoiding winter annuals such as common whitlowgrass *Erophila verna*, early forget-me-not *Myosotis ramosissima* and common cornsalad *Valerianella locusta*. The main communities represented are marram with red fescue *Festuca rubra* and sand sedge *Carex arenaria*, with lichens such as *Cetraria aculeata*. The dune slacks within this site are comparatively small and the Yorkshire-fog *Holcus lanatus* community predominates. They are

Name of European Site[8]	Feature for which there is potential for adverse effect	Project Phase	Potential Impact	Reason for no potential adverse effect on integrity alone or in combination
	halophilous scrubs (*Sarcocornetea fruticosi*). (Mediterranean saltmarsh scrub). Perennial vegetation of stony banks. (Coastal shingle vegetation outside the reach of waves). Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes). (Shifting dunes with marram). Petalwort *Petalophyllum ralfsii.* Otter *Lutra lutra.*			calcareous and the communities occur in association with swamp communities. Some of the slacks support the liverwort petalwort *Petalophyllum ralfsii*. In addition, the site supports otter *Lutra lutra*. The onshore cable corridor is located 0.32 km from the North Norfolk Coast SAC with greater distances to permanent infrastructure. No permanent loss or temporary disturbance/damage of habitats in the North Norfolk Coast SAC will occur during construction/decommissioning or operation and maintenance because of the spatial separation of the onshore cable corridor and associated infrastructure. There is no hydrological connection between the onshore cable corridor and associated infrastructure and the North Norfolk Coast SAC and therefore there is no reasonably foreseeable impact pathway in respect of accidental pollution during construction/decommissioning/operation and maintenance. The spatial separation between the onshore cable corridor and the SAC is sufficiently large that there is no reasonably foreseeable impact pathway for invasive non-native species during construction/decommissioning/operation and maintenance. Therefore, no adverse effect on site integrity will occur for construction/decommissioning.
		Operation	Temporary disturbance/damage. Accidental pollution. Invasive non-native species.	As stated above, the spatial separation and lack of hydrological connection between the onshore cable corridor and the SAC means that no adverse effect on site integrity will occur for operation.

For the reasons set out in Table 2 and because of the agreement between the Applicant and SNCBs, with no objections from any other interested parties, the Secretary of State considers there to be no adverse effects, either alone or in combination, on the integrity of the following sites:

- Berwickshire and North Northumberland Coast SAC,
- Forth Islands SPA,
- Humber Estuary SAC/Ramsar,
- Norfolk Valley Fens SAC,
- North Norfolk Coast SAC.

The Applicant's conclusions were disputed by the interested parties in relation to the remainder of the sites identified at the LSE stage. As such the Secretary of state has considered in turn the SPAs and SACs in more detail.

4.3 Offshore Ornithology

The following Sections consider the means by which birds have been identified as being potentially impacted by the Project, namely collision impacts with the wind turbines and increases in mortality due to displacement effects caused by the physical presence of turbines.

4.3.1 Collision Risk

Collision risk modelling was undertaken to estimate the annual mortality rate for a number of commonly occurring species and migratory species. The commonly occurring species were selected on the basis that they are vulnerable to collision risk and that regionally important populations would be coincident with the array area [APP-109]. They are as follows:

- Gannet,
- Kittiwake,
- Herring gull,
- Great black-backed gull,
- Lesser black-backed gull.

The modelling was undertaken using the Band (2012)[20] [REP3-021] collision risk model ("CRM").

Although a newer stochastic version of the model is now available, this was not the case until after submission of the Application and it is common ground that this version would not be used to assess the impacts of the Project [REP3-075].

There are two approaches to calculating collision risk in the Band model which are commonly referred to as the "basic" model and the "extended" model. The former assumes a uniform distribution of flights through the turbine rotor blades which equates to the same collision risk across the whole of the swept area. The latter assumes a non-uniform distribution of flights through the turbine blades which equates to a variable collision risk which is skewed towards the lower quadrants of the swept area [REP3-021].

[20] Band, B. (2012). Using a collision risk model to assess bird collision risks for offshore wind farms. The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-02. BTO and The Crown Estate. British Trust for Ornithology, Norfolk. Originally published Sept 2011, extended to deal with flight height distribution data March 2012.

The basic and extended models have different options which are linked to the use of different flight height data. Options 2 and 3 typically use generic data whereas Options 1 and 4 use data derived from site-specific surveys. Options 1 and 2 utilise the basic model and consequently assume a uniform collision risk whilst Options 3 and 4 utilize the extended model and consequently assume a more restricted collision risk.

Options 3 and 4 can reduce the number of bird rotor transits by more than 50% for some species which leads to a significant reduction in the associated collision risk estimate. However, when supported by suitably robust data, these options will often lead to a more biologically realistic parameterisation [REP3-021].

The Applicant views Option 1 and Option 2 as overly precautionary and used Option 3 as the basis for the determination of alone and in combination effects in the ES [APP-109] and the RIAA [APP-051]. NE does not agree with the use of Option 3 of the extended model because it is contrary to existing SNCB guidance [REP7-068]. It maintains that Option 2 of the basic model should be used for all species and this position remained unchanged throughout the Examination.

Similarly, a number of other issues relating to model parameterisation were highlighted in Relevant Representations from NE [RR-097] and RSPB [RR-113]. These relate to flight height, flight speed, avoidance rates and nocturnal activity factors. The definition of biological seasons, on the basis of different species phenology, and the apportioning of collision mortality were also raised as was the adequacy of an associated population viability analysis.

NE raised concerns over whether the RIES considered all of the CRM outputs [REP7-065]. The CRM was run with three different parameterisations that the Applicant considered valid. The first was in the original application [APP-109]. The second was submitted at Deadline 1 [REP1-188] and the third was submitted at Deadline 6 [REP6-042]. Two other parameterisations have also been submitted. The first was at Deadline 4 [REP4-049] and the second was at Deadline 6 [REP6-043]. Both of these have been run according to variations on the preferred SNCB parameterisation. A mixed parameterisation flowing from the considerations set out below was also submitted at Deadline 9 [REP9-047].

The Applicant submitted a Post Examination Submission exploring whether results from revised CRM, that incorporates supplementary aerial survey data obtained between January and March 2019, corresponded with the existing population estimates and densities used for kittiwake, and other species, used in the application (Ørsted 2019)[21]. The results from the assessment indicated results from CRM undertaken with the use of the additional data made no material effect to the conclusions made during Examination.

4.3.1.1 Flight heights

Collision risk is directly related to the size of the wind turbine rotor blades and the proportion of birds flying between the top and the bottom of the rotor sweep. This is termed potential collision height (“PCH”). The proportion of observed birds flying at PCH within a proposed array area is one of the main data inputs for the CRM. Consequently, incomplete baseline monitoring can have a significant effect on collision risk estimates, particularly when there is significant inter-annual variation in bird density.

The proportion of birds at PCH can either be set through the use of generic flight heights and/ or observed flight heights if robust, site specific survey data are present. NE considered the baseline data to be incomplete not only because of its limited duration but also because flight height data could not be derived from the digital aerial survey [REP4-130].

[21] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

The original CRM, as presented by the Applicant in the ES [APP-109], used boat-based survey data from Hornsea Project 1 and Hornsea Project 2 to parameterise Option 1 as well as the generic values from the literature [REP6-030] to parameterise Option 2 and Option 3. Only boat-based data points that overlapped with the survey area for the Project site and its 4 km buffer were selected. These surveys recorded flight heights within 5 m bands. The 35 m band (32.5 m – 37.5 m) was then used to calculate the number of each species at PCH. This was combined with the 30 m band (27.5 m - 32.5 m) to provide a further, more precautionary estimate of the number of individuals at PCH. The values that were derived and associated sample sizes are shown in Table 3.

Table 3: Number of birds at potential collision height

Species	Sample Size	35 m Band	27.5-35 m Band
Gannet	142	1.41	4.23
Kittiwake	510	0.78	1.76
Lesser black-backed gull	123	9.76	22.76
Great black-backed gull	177	7.34	19.21

NE questioned whether it was appropriate to use boat-based height data in conjunction with density data derived from aerial surveys [REP1-211]. This concern was based on a study by Johnston and Cook (2016)[22] [REP6-021] which showed that different flight height distributions were associated with different survey platforms. Whilst the boat-based surveys underestimated the flight height of gulls and kittiwake at lower densities, when compared with digital aerial surveys, it is clear that the distributions converge above 20 m.

Consequently, there is a high degree of similarity in flight height distribution between survey platforms for species flying at PCH. Whilst this was not the case for gannet, the difference in relative density between the different survey platforms was small and therefore unlikely to lead to substantial differences in collision risk.

Given the similarity in flight height distribution at the proposed PCH, the Secretary of State considers that this evidence does not provide a suitably robust justification for the use of only single survey platforms nor the exclusion of the boat-based flight height observations.

The standing advice from the SNCBs is that it is not appropriate to use the extended Band model to predict collisions for either kittiwake or gannet [REP7-068]. This is because Cook *et al*. (2014)[23] [REP4-037] note that there are significant differences between the observed proportion of birds at PCH and the proportion predicted to be at PCH from generic distributions of flight heights, with the latter generally lower than the former. However, this is not a justification against the use of empirical height data as it merely points to an inconsistency with an established practice for these species.

The same flight height data, i.e. boat-based observations and generic data from the literature, were used in the second [REP1-188] and third [REP6-042] iterations of the CRM that were based on the Applicant's preferred parameterisation. The generic data were also used in the first [REP4-049] and second [REP6-043] iteration of the CRM that were based on NE's preferred parameterisation.

[22] BTO Research Report Number 676; How high do birds fly? Development of methods and analysis of digital aerial data of seabird flight heights. Alison Johnston & Aonghais, S.C.P. Cook. February 2016

[23] BTO Research Report No. 656; The avoidance rates of collision between birds and offshore turbines. Aonghais S.C.P. Cook, Elizabeth M. Humphreys, Elizabeth A. Masden & Niall H.K. Burton. September 2014

4.3.1.2 Flight Speed

The CRM is sensitive to changes in flight speed as there is a direct relationship between the number of birds that pass through a turbine swept area in a given amount of time and the flight speed[24].

The Applicant submitted that an empirical study of flight speed by Skov *et al*. (2018)[25] [REP1-149] now provides the best available evidence on flight speeds for collision risk modelling [REP1-188]. This study measured the flight speed of seabirds using laser range finders at Thanet Offshore Wind Farm (OWF), near Foreness Point. The Applicant cited large sample sizes for each species in Skov *et al*. (2018) but it was clarified at Issue Specific Hearing (ISH) 7 [EV-024] that each track related to an individual bird which was measured multiple times. Consequently, only a limited range of individual behaviours and physiology was sampled.

The empirical observations of Skov *et al*. (2018) show consistently lower flight speeds across all species compared with those recommended by the SNCBs[26].

NE does not accept that Skov *et al*. (2018) provides best available flight speeds because the results are based on a single site outside the breeding season [REP3-075]. NE also highlighted that no gannet or kittiwake breeding colonies are within foraging range of the Thanet array [REP7-064].

The revised flight speeds from Skov *et al*. (2018) were used in the second [REP1-188] and third [REP6-042] iterations of the CRM that were based on the Applicant's preferred parameterisation. The revised flight speeds were not used in either the first [REP4-049] or second [REP6-043] iteration of the CRM that were based on NE's preferred parameterisation.

4.3.1.3 Avoidance Rates

Avoidance rates have typically been derived from an empirical review by Cook *et al*. (2014)[27] for Marine Scotland [REP4-037]. The SNCBs published a response on how avoidance rates should be applied in the offshore wind industry (JNCC *et al*. 2014)[28] [REP7-068]. It endorses the avoidance rates for all species except kittiwake. This is because the classification of the avoidance behaviour as being in the "small gull" category is disputed. Consequently, it is recommended that the avoidance rate for the basic Band model is 0.989 ("all gull") and not 0.992 ("small gull").

The Applicant used the SNCB recommended parameterisation for the first iteration of the CRM but not for subsequent iterations because of the changing evidence base. In the second iteration the Applicant relied upon Skov *et al*. (2018)[29]. However, a review of this work was subsequently published by Bowgen and Cook (2018)[30] [REP4-035] which was then used in the third iteration [REP6-042].

[24] Masden, E.A. (2015) *Developing an avian collision risk model to incorporate variability and uncertainty. Environmental Research Institute North Highland Col*lege – UHI University of the Highlands and Islands.

[25] Skov, H., Heinänen, S., Norman, T., Ward, R.M., Méndez-Roldán, S. & Ellis, I. (2018). *ORJIP Bird Collision and Avoidance Study.* Final report – April 2018. The Carbon Trust. 247 pp.

[26] 13.3 m/ sec vs 14.9 m/ sec for gannet, 8.7 m/ sec vs 13.1 m/ sec for kittiwake and 9.8 m/ sec for the gulls

[27] Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. and Burton, N.H.K. (2014). *The avoidance rates of collision between birds and offshore turbines*. Thetford: British Trust for Ornithology.

[28] JNCC (2014). *Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review*. Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resource Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Natural Heritage (SNH).

[29] Skov, H., Heinänen, S., Norman, T., Ward, R.M., Méndez-Roldán, S. & Ellis, I. (2018). *ORJIP Bird Collision and Avoidance Study*. Final report – April 2018. The Carbon Trust. 247 pp.

[30] Bowgen, K. & Cook, A. (2018). *Bird Collision Avoidance: Empirical evidence and impact assessments*. JNCC Report No. 614, JNCC, Peterborough, ISSN 0963-8091.

NE highlighted [REP7-065] that this has led to a shifting CRM parameterisation and a conflicting set of results and submitted that changes in the avoidance rate have the greatest effect on the CRM results which means that this variable must either be derived from a robust evidence base or otherwise be suitably precautionary.

Skov *et al*. (2018) is an empirically based study of bird behaviour in and around the Thanet OWF which is approximately 11 km off Foreness Point in Kent. It comprises 100, 3 MW wind turbines located in water depths of 15 to 25 m below chart datum covering an area of 35 km^2. The study has generated the most extensive observational dataset of bird behaviour associated with an operational OWF to date. A revised set of AR are set out in paragraph 9.1.12 of the report which are an order of magnitude greater than currently advised in JNCC *et al*. (2014).

NE dispute the use of the Skov *et al*. (2018) values because it maintains that they are not directly comparable to avoidance rates in existing guidance which are derived by comparing observed and predicted collision rates rather than purely through empirical observation. As the predicted collision rates are based on estimates from the Band model, they incorporate elements of model-error arising from its assumptions. NE also notes that the study suggests that the Band model may be underestimating the probability that a bird will collide when crossing the rotor swept area.

Following these concerns, Bowgen & Cook (2018)[31] was commissioned to determine how the results of Skov *et al*. (2018) should be used in CRM. They recommend avoidance rates of 0.995 for gannets and large gulls and 0.990 for kittiwake in relation to the basic model and 0.993 for large gulls and 0.980 for kittiwake in relation to the extended model.

NE was unable to comment on the implications of the study at ISH5 [EV-018] nor at Deadline 7 in response to a Rule 17 question on this matter (F2.29 [REP7-064]).

The avoidance rates used in the first iteration of the CRM [APP-109] were consistent with the approach recommended by the SNCBs. The second [REP1-188] and third [REP6-042] iterations of the Applicant's preferred parameterisation used avoidance rates from Skov *et al*. (2018) and Bowgen & Cook (2018) respectively. The first [REP4-049] and second [REP6-043] iteration of the NE parameterisation used the JNCC *et al*. (2014)[32] recommended avoidance rates.

4.3.1.4 Nocturnal activity factors

Band (2012) recommends the use of Nocturnal Activity Factors as defined in Garthe & Hüppop (2004)[33] [REP4-039] and King *et al*. (2009)[34] in the absence of night-time survey data or other empirical evidence of nocturnal activity levels. The use of these values was reviewed [REP7-025] as part of the East Anglia Three OWF application. The report concluded that a Nocturnal Activity Factor of 1 should be applied to gannet and a Nocturnal Activity Factor of 2 should be applied to kittiwake.

The Applicant undertook a literature review which suggested that there is little evidence of nocturnal activity for gannet and only limited activity for kittiwake [APP-109]. This is consistent with the results in Skov *et al*. (2018) where 48,000 night-time videos were processed with only 0.2% recording any night

[31] Bowgen, K. & Cook, A. (2018). *Bird Collision Avoidance: Empirical evidence and impact assessments*. JNCC Report No. 614, JNCC, Peterborough, ISSN 0963-8091.

[32] JNCC (2014). *Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review*. Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resource Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Natural Heritage (SNH).

[33] Garthe S, Huppop O (2004) Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. *Journal of Applied Ecology* 41: 724–734, 2004.

[34] King, S., Maclean, I.M.D., Norman, T. and Prior, A. (2009) *Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers*. COWRIE.

flying bird activity (total of 76 tracks). However, the authors stress that the results are only anecdotal because of the limited sample size.

NE disputed the Nocturnal Activity Factors that were used for gannet and kittiwake in its Deadline 1 response [REP1-211] and stated that there are no agreed, "empirically derived" Nocturnal Activity Factors that can be used with the Band (2012) model. NE recognises that nocturnal activity levels for some species may be lower than those typically used but view the evidence as equivocal.

The CRM iterations using the variables preferred by NE remained the same throughout [REP4-049 and REP6-043]. NE noted at Deadline 4 [REP4-130] that the Nocturnal Activity Factors presented at Deadline 1 [REP1-188] were not the same as those used for the collision risk assessments in the Applicant's ES and RIAA, as summarised in [APP-109].

4.3.1.5 Conclusions

At the end of the Examination the ExA felt that it might assist the SoS if the Band 2012 model were run using a set of parameters derived from their assessment. They therefore asked the Applicant to run the Band (2012) CRM according to their suggested parameterisation and conclude on the implications for the ES and the RIAA (F3.1 [PD-020]). This was submitted at Deadline 9 [REP9-047]. This final CRM used Option 1 for kittiwake and gannet and Option 3 for the Auk species.

The ExA note that the final CRM analysis was submitted by the Applicant at a late stage in the examination and that it was important in informing their assessment. However, they consider that the issues around parameterisation were well rehearsed during the course of the Examination and consequently did not find the submission of the final CRM analysis prejudicial to the interests of any party.

The ExA also note that they considered the results of the CRM analysis that was undertaken in broad accordance with NE advice [REP6-043] as well as NEs response at Deadline 7 [REP7-078]. However, they did not find that this had a significant bearing on their recommendations due to its overly precautionary nature and the unconvincing justification for some of the parameters (as set above).

Following request by the Secretary of State for further information [35], the Applicant updated the CRM to account for changes in the project design, namely a reduction in the number of turbines to no more than 231, a reduction in the rotor swept area to 8.8 km^2 and an increase in lower rotor tip height to 40 m above Mean Sea Level (Ørsted 2020)[36]. NE have advised that as the revised parameters did not fully exclude collision impacts their advice remains unchanged (Natural England 2020)[37].

The Secretary of State recognises the methodological disagreements between the NE, the RSPB and the Applicant and has considered the representations made by the Applicant, NE and the RSPB and the recommendations made by the ExA. The Secretary of State recognises the precautionary approach to CRM being proposed by NE and is satisfied that his conclusions in the Appropriate Assessment can be based on outputs from CRM based on the NE preferred approach and the revised project design.

4.3.2 Displacement Mortality

NE and RSPB raised concerns in relation to the assessment of displacement mortality because displacement effects require the calculation of a seasonal mean of peaks between different years. As there were four missing months from the digital aerial survey (December-March), they were concerned

[35] BEIS (2019). Planning Act 2008 – *Hornsea Project Three offshore wind farm – Request for extension of consultation*.

[36] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020

[37] Natural England (2020) *Hornsea Project Three – Applicant's submission to Secretary of State Consultation Request for further information*. Natural England. 22 April 2020.

that the calculation did not fully capture the inter-annual variability in bird numbers and consequently introduced uncertainty that could not be quantified [REP1-211].

NE agrees that Lawson *et al*. (2016)[38] [REP4-040] is suitable for determining the likely displacement effects along the export cable corridor. NE and RSPB also raised concerns about the way in which seasons were defined in the calculation of the mean seasonal peaks and recommended the use of colony specific information. This would have extended the breeding season and consequently increased the displacement mortality for breeding gannet, puffin and kittiwake [REP1-111]. NE disagreed with the mean seasonal peaks used by the Applicant to calculate displacement mortality for gannet and puffin [RR-097].

The ExA do not recommend the use of longer breeding seasons on the basis of the evidence provided and considers that the incomplete baseline simply adds precaution to estimates rather than fundamentally undermining the conclusions of the ES [APP-065] or the RIAA [APP-051].

The Applicant has followed SNCB guidance in terms of expressing the variability associated with population estimates and the approach was supported by a literature review to identify evidence-based displacement and mortality rates for use in displacement analyses. The Secretary of State notes that there was no specific rebuttal of the Applicant's position by interested parties.

4.3.3 In Combination Assessment Methodology

The Applicant undertook a screening exercise to identify projects and plans they considered relevant to the AA [APP-097].

The Applicant allocated all projects and plans considered in-combination alongside Hornsea Three into 'Tiers', reflecting their current stage within the planning and development process. Appropriate weight is then given to each Tier in the decision-making process when considering the potential in-combination impact associated with the Project. An explanation of each tier is included below:

- Tier 1: Hornsea Three considered alongside other project/plans currently under construction and/or those with a legally secure consent that have been awarded a Contract for Difference (CFD) but have not yet been implemented and/or those currently operational that were not operational when baseline data was collected, and/or those that are operational and have an on-going impact;
- Tier 2: All projects/plans considered in Tier 1, as well as those project/plans that have a consent but have no CFD and/or submitted, but not yet determined, application;
- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent. Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future, those projects where a Scoping Report is available and/or those projects which have published a PEIR.

[38] Lawson, J., Kober, K., Win, I., Allcock, Z., Black, J. Reid, J.B., Way, L. & O'Brien, S.H. (2016). *An assessment of the numbers and distribution of wintering red-throated diver, little gull and common scoter in the Greater Wash*. JNCC Report No 574. JNCC, Peterborough.

The following (Tier 1 and 2) projects were considered in the Applicant's in combination assessment

- Aberdeen
- Greater Gabbard
- Thanet
- Hornsea Project Two
- Gunfleet Sands Demo
- Westermost Rough
- Moray East
- Gunfleet Sands I
- Dogger Bank Creyke Beck A
- Neart na Gaoithe
- Gunfleet Sands II
- Dogger Bank Creyke Beck B
- Triton Knoll
- Humber Gateway
- Dogger Bank Teesside A
- Beatrice
- Kentish Flats
- Sofia (formerly Dogger Bank Teesside B)
- Blythe Demo
- Kentish Flats Extension
- East Anglia Three
- East Anglia One
- Lincs/LID
- Inch Cape
- Galloper
- London Array
- Kincardine Offshore Wind Farm
- Hornsea Project One
- Lynn and Inner Dowsing Wind Farms
- Methil Demonstration Project (2B Energy)
- Hywind Scotland Pilot Park
- Methil Demo
- SeaGreen Alpha
- Race Bank
- Scoby Sands
- SeaGreen Bravo
- Rampion Wind Farm
- Sheringham Shoal
- Norfolk Vanguard
- Dudgeon
- Teesside
- Moray West

5 Appropriate Assessment

5.1 Appropriate Assessment: Coquet Island SPA

Coquet Island is located approximately 1 km of the Northumberland coast in north-east England. The island is approximately 0.07 km^2 and is located over 283 km from the Project Area. The site was originally classified in 1985 for breeding populations of a number of seabirds (common, Arctic, roseate and Sandwich tern). An amendment in 2017[39] incorporated those species that formed part of the original SPA in addition to a breeding seabird assemblage consisting of 47,662 individual seabirds with the four aforementioned species, puffin and black-headed gull representing the main components of the assemblage[40]. In addition there are a number of non-listed assemblage features including fulmar, herring gull, lesser black-backed gull and kittiwake.

The conservation objectives for the site are set out in Table 4.

Table 4: Conservation objectives for the Coquet Island SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features • the distribution of qualifying features within the site

The LSE test identified a potential adverse effect on the integrity on the fulmar features of the SPA due to displacement from the operation phase of the project.

5.1.1 Fulmar: Alone Assessment

Fulmar has an extensive foraging range meaning that the Project Area is within foraging range of fulmar from the Coquet Island SPA.

When apportioning fulmar from the Coquet Island SPA to the Project Area, the Applicant assumed that the contribution is related to the size of the breeding population. Using this approach, the Applicant estimates that the proportion of fulmar present in the Project Area that originate from the breeding population at the Coquet Island SPA is 0.72%.

[39] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9006031&SiteName=coquet&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=#SiteInfo

[40] Natural England (2015) *Departmental Brief: Coquet Island Special Protection Area (SPA) – site amendment.* [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492866/coquet-island-departmental-brief.pdf.

For the post-and pre-breeding seasons (autumn and spring) the BDMPS population from Furness (2015)[41] is 957,502 individuals of which 0.009% are from the colony at Coquet Island SPA.

In the non-breeding season (winter), the BDMPS population is an estimated 568,736 individuals of which 0.01% are from the colony at Coquet Island SPA.

The Applicant applied a displacement rate range of 10-30% in all seasons and a mortality rate of 2% in the breeding season with a 1% mortality rate in all other seasons.

Using the figures above, the Applicant calculated that during the breeding season (April-August) 10 birds can be apportioned to the Coquet Island SPA. Displacement analysis for fulmar predicts mortality of less than one fulmar in the breeding season based on a displacement rate range of 10-30% and a mortality rate of 2%. Therefore, the applicant considers that birds lost to the population as a result of displacement would represent a negligible proportion of the SPA population and an insignificant increase in the baseline mortality of that population.

The Applicant considered that the mean-peak fulmar population estimate calculated for the Project Area during all three non-breeding seasons that can be apportioned to the Coquet Island SPA is less than one bird. As such, considered there to be no impact on the SPA as a result of displacement in these seasons.

NE advised that because of its concerns about the baseline data and the Applicant's approach to the assessment of impacts, it is unable to conclude beyond reasonable scientific doubt that the conservation objectives of designated sites, including these ones, would not be hindered as a result of the Proposed Development [REP1-211].

The applicant submitted supplementary aerial survey data collected between January and March 2019 that showed higher numbers of fulmar in January 2019 compared with the same period in 2017 but similar numbers between the two years for February and March. Consequently the estimated population during the pre-breeding period increased from the 525 individuals used by the Applicant in the ES [APP-065] to 1,049 (Ørsted 2019) [42]. Although the pre-breeding population has increased following the collection of additional data the displacement mortality on the North Sea population remains broadly similar to that used in the Application and the estimated mortality on the North Sea fulmar population based on the supplementary data makes no material difference to the estimated mortality on fulmars from the SPA.

The Secretary of State agrees with the conclusions of the ExA. He has considered the above concerns but does not find them of sufficient weight to significantly alter the conclusions that have been reached by the Applicant in the ES [APP-065] and the RIAA [APP-051].

Therefore, the Secretary of State considers that there would be no adverse effect on the integrity of the site from displacement mortality from the Project alone.

5.1.2 Fulmar: In Combination Assessment

The Applicant highlights the fact that there is little quantitative information on potential displacement of fulmar arising from other wind farm projects which are capable of acting in combination. Consequently, it maintains that the Proposed Development is unlikely to materially alter current in combination displacement impacts and that there would, consequently, be no adverse effect on the integrity of either population [APP-051].

[41] Furness, R.W. (2015). *Non-breeding season populations of seabirds in UK waters. Population sizes for Biologically Defined Minimum Population Scales (BDMPS)*. Natural England Commissioned Report NECR164.

[42] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

As with the alone assessment, given the argument above and the extremely low number of individuals that would be affected, the Secretary of State is satisfied that there would be no adverse effect on the integrity of the SPA from displacement mortality in combination with other plans or projects.

5.2 Appropriate Assessment: Farne Islands SPA

The Farne Islands are a group of low-lying islands approximately 2-6 km offshore of the Northumberland coast in north-east England. The islands have a total area of approximately 1 km^2 and are located over 304 km from Hornsea Three. The Farne Islands SPA was originally classified in 1985 due to the presence of breeding populations of seabirds (common tern, Sandwich tern and Arctic tern). An amendment in 2017 incorporated those species that formed part of the original SPA alongside two additional breeding features (roseate tern and guillemot) and a breeding seabird assemblage incorporating four main components (puffin, cormorant, shag and kittiwake). In addition there are a number of non-listed assemblage features including fulmar, black-headed gull, great black-backed gull, herring gull, lesser black-backed gull and razorbill.

The conservation objectives for the site are set out in Table 5.

Table 5: Conservation objectives for the Farne Islands SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features • the distribution of qualifying features within the site

The LSE test identified a potential adverse effect on the integrity on the fulmar features of the SPA due to displacement from the operation phase of the project.

5.2.1 Fulmar: Alone Assessment

Fulmar has an extensive foraging range meaning that the Project Area is within foraging range of fulmar from the Farne Islands SPA.

When apportioning fulmar from the Farne Islands SPA to the Project Area, the Applicant used the assumption that the contribution is related to the size of the breeding population. Using this approach, the Applicant estimates that the proportion of fulmar present in the Project Area that originate from the breeding population at the Farne Islands SPA is 4.15%.

For the post-and pre-breeding seasons (autumn and spring) the BDMPS population from Furness (2015)[43] is 957,502 individuals of which 0.05% are from the colony at Farne Islands SPA.

In the non-breeding season (winter), the BDMPS population is an estimated 568,736 individuals of which 0.06% are from the colony at Farne Islands SPA.

[43] Furness, R.W. (2015). *Non-breeding season populations of seabirds in UK waters. Population sizes for Biologically Defined Minimum Population Scales (BDMPS)*. Natural England Commissioned Report NECR164.

The Applicant applied a displacement rate range of 10-30% in all seasons and a mortality rate of 2% in the breeding season with a 1% mortality rate in all other seasons.

Using the figures above, the Applicant calculated that during the breeding season (April-August) 59 birds can be apportioned to the Farne Islands SPA. Displacement analysis for fulmar predicts mortality of less than one fulmar in the breeding season based on a displacement rate range of 10-30% and a mortality rate of 2%. Therefore, the applicant considers that birds lost to the population as a result of displacement would represent a negligible proportion of the SPA population and an insignificant increase in the baseline mortality of that population.

The Applicant considered that the mean-peak fulmar population estimate calculated for the Project Area during all three non-breeding seasons that can be apportioned to the Farne Islands SPA is less than one bird. As such, considered there to be no impact on the SPA as a result of displacement in these seasons. The additional supplementary data obtained from aerial surveys between January and March 2019 makes no material difference to the estimated level of mortality (Ørsted 2019)[44].

NE advised that because of its concerns about the baseline data and the Applicant's approach to the assessment of impacts, it is unable to conclude beyond reasonable scientific doubt that the conservation objectives of designated sites, including these ones, would not be hindered as a result of the Proposed Development [REP1-211].

The ExA and considered the above concerns but did not find them of sufficient weight to significantly alter the conclusions that have been reached by the Applicant in the ES [APP-065] and the RIAA [APP-051]. The Secretary of State agrees with the ExA conclusions and considers that there would be no adverse effect on the integrity of the site from displacement mortality from the Project alone.

5.2.2 Fulmar: In Combination Assessment

The Applicant highlights the fact that there is little quantitative information on potential displacement of fulmar arising from other wind farm projects which are capable of acting in combination. Consequently, it maintains that the Proposed Development is unlikely to materially alter current in combination displacement impacts and that there would, consequently, be no adverse effect on the integrity of either population [APP-051].

As with the alone assessment, given the argument above and the extremely low number of individuals that would be affected, the Secretary of State is satisfied that there would be no adverse effect on the integrity of the SPA from displacement mortality in combination with other plans or projects.

5.3 Appropriate Assessment: Flamborough and Filey Coast SPA

The Flamborough and Filey Coast SPA is a coastal site covering an area of approximately 8,040 ha which spans the East Riding of Yorkshire, North Yorkshire and Scarborough. Its marine extent covers approximately 7,472 ha and it is located approximately 149 km from the Proposed Development. The SPA citation has a designated kittiwake population of 44,520 pairs and in addition to gannet (8,469 pairs), guillemot (41,607 pairs) and razorbill (10,570 pairs), and a breeding seabird assemblage of 215,750 individuals. As part of a breeding seabird assemblage the SPA also supports 1,447 pairs of fulmar (a listed component of the assemblage) and 980 pairs of puffin (a non-listed component of the assemblage).

NE published conservation objectives for the Flamborough and Filey Coast are set out in Table 6.

[44] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019

Table 6: Draft conservation objectives for the Flamborough and Filey Coast SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features • the distribution of qualifying features within the site

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect is likely.

5.3.1 Apportioning for Flamborough and Filey Coast SPA

Apportioning is done in order to determine the mortality that is likely to arise from collision (and displacement). This is then apportioned to the qualifying features of different European sites. In this context, the apportioning relates to the proportion of gannet and kittiwake at Flamborough and Filey Coast SPA that are likely to be at risk of turbine collision during the operational phase of the Proposed Development.

Age class data from boat-based surveys, derived from earlier Hornsea projects, were used to identify the proportion of adult and immature birds likely to be present in the array area during the breeding season. The Applicant noted that this may include birds from other colonies at the beginning and end of the breeding seasons defined in Furness (2015) [REP1-211] and that these months should consequently be excluded from any subsequent analysis because the majority of individuals would not be attributable to the Flamborough and Filey Coast SPA [APP-054].

The Applicant submitted that the gannet apportioning for this site is 40.4% (breeding season), 4.8% (post-breeding) and 6.2% (pre-breeding). Breeding was defined as being between April and August.

Both the RSPB and NE dispute this approach [RR-113 and RR-097]. In NE's view, breeding seasons should be defined by the breeding population under consideration and informed by colony-specific data (the full extent of time that breeding activities take place). It advised that the appropriate breeding season should be defined by when birds are present at the Flamborough and Filey Coast SPA and notes that the colony observations of kittiwake, gannet and puffin at this colony are 'closely aligned' to the breeding seasons described in Furness (2015)[45].

NE stated that the definition of a shorter breeding season reduces the predicted collision impacts because lower (non-breeding) apportioning rates are assigned to the months when breeding birds may be present in the array area.

The ExA questioned the Applicant on this issue, in particular why the breeding season used in Furness (2015) was not used by the Applicant to apportion impacts. The Applicant highlighted that the presence of migrating adults at the beginning of the breeding season and immature birds towards the end of the

[45] Furness, R.W. (2015). *Non-breeding season populations of seabirds in UK waters. Population sizes for Biologically Defined Minimum Population Scales (BDMPS).* Natural England Commissioned Report NECR164.

breeding season would lead to an over-estimate of the mortality that would be attributable to the Flamborough and Filey Coast SPA [REP4-012].

The Applicant highlights two tracking studies in support of the shorter breeding season which suggest limited or no connectivity between the Project array area and the Flamborough and Filey Coast SPA. These are Langston *et al*. (2013)[46] and Cleasby *et al*. (2018)[47].

Langston *et al*. (2013) considers the foraging range of gannets in relation to proposed OWFs in the North Sea. It is a three year study where adult birds were fitted with satellite tags to investigate their foraging ranges during chick-rearing and early post-breeding periods. A total of 42 birds from Bempton Cliffs, which is part of the Flamborough and Filey Coast SPA, were tracked over this period.

Cleasby *et al*. (2018) is a five year, large scale tracking study that mapped the distribution of a number of species during the breeding season. Habitat selection models were used to define areas of high utilisation or hotspots that are important to particular seabirds. It shows that there are important areas for kittiwake off the east coast of Yorkshire. However, these would not coincide with the Project array area [REP4-051].

The ExA are satisfied that these tagging surveys show a relatively low utilisation of the Project array area by gannet and kittiwake and therefore, the risk of underestimating the collision risk to either species from using shorter breeding seasons is consequently a remote possibility.

Given the above, the Secretary of State agrees with the conclusions of the ExA that the use of the longer breeding season to apportion impacts to the gannet and kittiwake populations at Flamborough and Filey Coast SPA is not justified and therefore, in this case, favours the Applicant's preferred shorter breeding season.

5.3.2 Population Viability Analysis for Flamborough and Filey Coast SPA

Population viability analysis (PVA) is done in order to determine whether the mortality that is likely to arise from turbine collision (and displacement) would have an adverse effect on the qualifying features of relevant European sites.

In this context, this relates to the apportioned mortality of breeding gannet and kittiwake populations associated with Flamborough and Filey Coast SPA. The method generally considers the likely population growth (or decline) with and without an assumed level of additional mortality arising from a particular activity.

The Applicant relied upon a model that was developed for evaluating the impacts on the qualifying features of the Flamborough and Filey Coast SPA in relation to the Hornsea Two OWF and extrapolated the outputs to 35 years to reflect the design lifetime of the Project.

This approach was disputed by RSPB [RR-113] and NE [RR-097]. NE indicates that a greater number of simulations would have been preferable [REP6-055] but had no other substantive concerns at the close of the Examination [REP8-005]. Given the absence of any statistical justification for this position the Secretary of State gives this residual concern little weight.

RSPB maintains that there are a number of confounding variables such as climate change and alterations to fishing discard policy which mean that it is not possible to make predictions about the viability of either

[46] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/270402/OESEA2_North_Sea_Gannet_Tracking_Year3_Report.pdf

[47] Cleasby IR, Owen E, Wilson LJ, Bolton M (2018). *Combining habitat modelling and hotspot analysis to reveal the location of high density seabird areas across the UK:* Technical Report. RSPB Research Report no. 63. RSPB Centre for Conservation Science, RSPB, The Lodge, Sandy, Bedfordshire, SG19 2DL.

the gannet or kittiwake populations of the Flamborough and Filey Coast SPA in 35 years time. RSPB argues that recent declines in kittiwake productivity have not been adequately considered [REP9-029].

The Secretary of State acknowledges that any population model-based prediction necessarily carries these caveats but, in this instance, supports the use of PVA to help inform the potential level of effect predicted impacts may have on a population.

5.3.3 Northern Gannet: Alone Assessment

The Secretary of State identified a potential LSE on gannet from collision with wind turbines and displacement in the breeding, pre-breeding and post-breeding seasons (adult birds) during the operational phase of the project.

The SPA supports a growing population of breeding gannets the Applicant assumes to comprise 8,469 pairs of breeding adults as detailed in the Departmental Brief for the SPA (Natural England 2014).[48]

5.3.3.1 Collision mortality

The Applicant undertook CRM (see Section 4.3.1) to estimate collision mortality impacts on the gannet features of the Flamborough and Filey Coast SPA. The analysis (using the Secretary of State's accepted methodology) showed a total collision risk of between 5-14 individuals per annum and an apportioned collision risk of 2-5 individuals per annum for Option 1. The ES [APP-109] and the RIAA [APP-051] reported the total collision risk as being 17 individuals per annum and an apportioned collision risk of 4 per annum for Option 1. The target breeding population for this feature at this site is 8,469 pairs [APP-051]. The results indicate a 0.23-0.27% increase in baseline mortality as opposed to the 0.3% increase for Option 1 indicated in the RIAA [APP-051].

The density of gannets from the additional supplementary aerial survey data obtained between January and March 2019 were very similar to those collected in 2017 and the predicted number of collisions incorporating the additional data were identical to those previously assessed (Ørsted 2019)[49].

The Applicant's revised analysis shows that despite the extended breeding season and the additional survey data, only a small proportion of the population would be affected and that this would result in only a small increase in background mortality. As the revised impacts are either similar or reduced, these results do not fundamentally alter the conclusions of the ES [APP-109] or the RIAA [APP-051].

5.3.3.2 Displacement Mortality

The Applicant submitted that while the operational footprint of Project may provide limited disturbance to foraging gannets from the Flamborough and Filey Coast SPA, the distance the Project Area is from the colony is well above the mean foraging range measured by Langston *et al*.(2013)[50]. It is therefore unlikely that it forms a notably important foraging area for this species.

The Applicant used a displacement range of 30-70% from the Project Area and 2 km buffer during the breeding and non-breeding seasons and a displacement mortality of 2% for the breeding season and 1% for all non-breeding seasons.

[48] Natural England (2014). *Departmental brief: Proposed extension to Flamborough Head and Bempton Cliffs Special Protection Area and renaming as Flamborough and Filey Coast potential Special Protection Area (pSPA)*. Natural England.

[49] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

[50] Langston, R.H.W., Teuten, E. and Butler, A. (2013). *Foraging ranges of northern gannets Morus bassanus in relation to proposed offshore wind farms in the North Sea: 2010-2012*. Sandy: Royal Society for the Protection of Birds.

The Applicant's displacement analysis predicts mortality of three to eight gannet in the breeding season. Therefore, birds lost to the population as a result of displacement represent 0.02-0.04% of the SPA breeding population (8,469 pairs) and would result in a 0.24-0.55% increase in background mortality (1,372 individuals). The predicted mortality for the non-breeding seasons is less than one bird from the Flamborough and Filey Coast SPA.

The Secretary of State recognises the methodological disagreements between NE and the Applicant. He has considered the representations made by the Applicant, NE and the RSPB (including those made subsequent to Examination) and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential increased gannet collision mortality as a result of the Project alone would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

5.3.4 Northern Gannet: In Combination Assessment

The Applicant considered impacts on the gannet feature of the Flamborough and Filey SPA in combination with the plans and projects shown in Section 4.3.3.

5.3.4.1 Collision Risk

The Applicant applied a mean-maximum foraging range of 229 km to determine which projects were included within the in-combination assessment during the breeding season. For those projects within mean-maximum foraging range a precautionary assumption that 100% of birds within the project sites originate from the SPA during the breeding season has been applied with the exception of the three Hornsea projects and all four Dogger Bank projects.

For the three Hornsea projects the apportioning value calculated for the breeding season is used following the approach used at Hornsea Project Two. For the Dogger Bank projects it has been assumed that 50% of birds present within the project site are adult birds from the SPA. These figures were agreed by NE in the examinations for these projects.

For Tier 1 projects, a total in-combination collision risk mortality of 119 gannets is apportioned to the SPA across a full annual cycle with Hornsea Three contributing 2.9% of this total. This level of in combination mortality represents 0.7% of the SPA population (8,469 pairs) and an 8.8% increase in baseline mortality (1,372 individuals). When Tier 2 projects are included, the in-combination collision risk mortality is 193, which represents 1.14% of the SPA population and a 14.1% increase in baseline mortality.

The Applicant also presented CRM using a revised turbine scenario from a study undertaken by MacArthur Green (2017)[51] which used the as-built turbine numbers for the in combination projects already in their operational phase. Using the as-built turbine numbers, the total in-combination collision risk estimate for Tier 1 reduces by 5%. When all tiers are considered the reduction is 19.3%.

5.3.4.2 Displacement

The Applicant considered there to be little quantitative information available on the potential displacement of gannet from other wind farm projects that may act in-combination with Hornsea Three. The assessment undertaken for Hornsea Project Two considered the available information and concluded that quantitative assessments are available for four projects: Hornsea Project One, Hornsea Project Two, Dogger Bank Creyke Beck A & B, and Sofia (formerly Dogger Bank Teesside B). The total displacement mortality associated with these projects is 15 gannets based on the displacement and mortality rates applied in the assessments for each project.

[51] MacArthur Green (2017). *Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality*. The Crown Estate.

Therefore, the Applicant concluded that the combined predicted mortality of Hornsea Three (8 individuals) together with Hornsea Project One, Hornsea Project Two, Dogger Bank Creyke Beck A & B, Dogger Bank Teesside A and Sofia (formerly Dogger Bank Teesside B) is assumed to be 23 gannets.

This represents 0.14% of the Flamborough and Filey Coast SPA population (8,469 pairs) and results in an increase in background mortality (1,372 individuals) of 1.68%.

5.3.4.3 Conclusions

NE and the RSPB's representations on the parameters used by the Applicant are discussed in Section 4.3 and in that section the Secretary of State agreed with the ExA's preferred parameters for CRM which were used by the Applicant in their Deadline 9 CRM submission.

In the RIAA the Applicant argued that the current population of gannet at the Flamborough and Filey Coast SPA (26,784 individuals) is approximately 58% higher than the cited population and that over the lifetime of the Project the population of gannet at the SPA would continue to increase (despite being 2.5% lower than it would have been without the presence of Tier 1 projects). The Applicant argues that this additional mortality would not result in the gannet population declining below the cited population.

The Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant. He has considered the representations made by the Applicant, NE and the RSPB (including those made subsequent to Examination) and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential increased gannet collision mortality as a result of the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

5.3.5 Kittiwake: Alone Assessment

The Secretary of State identified a potential LSE on kittiwake from collision with wind turbines in the breeding, pre-breeding and post-breeding seasons (adult birds) during the operational phase of the project.

The Applicant undertook CRM (see Section 4.3.1) to estimate collision mortality impacts on the kittiwake features of the Flamborough and Filey Coast SPA. The analysis (using the Secretary of State's precautionary approach) showed a collision risk of 181 (CI 112-257). (The ES [APP-109] and the RIAA [APP-051] reported a collision risk of 8 per annum for Option 1 based on the Applicant's preferred methodology). The target breeding population for this feature at this site is 44,520 pairs [APP-051]. The baseline mortality is 13,000 individuals per year and the predicted loss of an additional 181 birds per year results in a 1.3% increase in baseline mortality as opposed to the 0.06% increase for Option 1 indicated by the Applicant during examination.

The monthly densities of kittiwakes from the supplementary aerial survey data obtained between January and March 2019 were very similar to those collected in 2017 and the predicted number of collisions (using the Secretary of State's accepted methodology) incorporating the additional data were either identical to those previously assessed or, under one scenario, increased by one (Ørsted 2019)[52]. Consequently, the additional survey data does not change the estimated impacts presented and assessed within the ES or RIAA.

Following the request made by the Secretary of State for further information the Applicant submitted revised CRM based on the updated wind farm and turbine parameters. Following the Secretary of State's precautionary methodology the estimated number of kittiwake collisions per year was reduced to between

[52] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

65 and 73 individuals (CI 40-46 to 91-104) and thus reducing the predicted number of collisions per year by between 59.1 to 64.1% from that considered during Examination.

The additional assessment and revised wind farm and turbine parameters reduce the predicted number of kittiwakes at risk of collision from that considered in Examination.

The Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant. He has considered the representations made by the Applicant, NE and the RSPB (including those made subsequent to Examination) and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential increased kittiwake collision mortality as a result of the Project alone would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

5.3.6 Kittiwake: In Combination Assessment

The Applicant used a breeding season mean-maximum foraging range of 156 km. For projects within foraging range, project-specific apportioning values have been used where available. This therefore applies to Hornsea Project One, Hornsea Project Two and Dogger Bank Creyke Beck A&B. The apportioning approach used for assessments at the Dogger Bank Creyke Beck projects has been updated as part of the assessments undertaken for East Anglia Three, which utilised contemporaneous population data instead of updated population data for the SPA. As such, the apportioning value used for Dogger Bank Creyke Beck A&B has been updated to reflect the updated apportioning value calculated in the assessments for East Anglia Three.

Following the request by the Secretary of State for further information the Applicant has submitted revised wind farm and turbine parameters that:

- Increase the lower blade tip height from 33.17 m to 40 m at MSL (34.97 m to 41.8 m (LAT)).
- Reduce the maximum number of turbines from 300 to 231.
- Reduce the rotor swept area from 9.0 km^2 to 8.8 km^2.

Revised CRM incorporating the revised wind farm and turbine parameters and following the Secretary of State's precautionary approach has been undertaken by the Applicant. The results of the modelling indicate a total in-combination collision impact on kittiwakes of between 315 – 323 (CI 290 – 354) individuals per year (Ørsted 2020)[53], this is equivalent to an increase in the baseline mortality of kittiwakes at the Flamborough and Filey Coast SPA of between 2.23 – 2.27%.

The Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant, particularly those explored in Section 4.3. He has considered the representations made by the Applicant, NE and the RSPB (including those made subsequent to Examination) and the recommendation as made by the ExA.

The Secretary of State is satisfied that although there may be an impact on kittiwakes from the SPA, the potential increase in kittiwake collision mortality as a result of the Project alone would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

The Secretary of State cannot rule out that the potential increase in kittiwake collision mortality in-combination with other plans or projects would not represent an adverse effect on the Flamborough and Filey Coast SPA. Although the Project alone will not have an adverse effect, the contribution it could make to the total in combination impact is not insignificant. There is a high level of confidence, based on the science, that there will be a population level effect on kittiwake from this SPA.

[53] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020.

5.3.7 Auk Species (Puffin, Guillemot, Razorbill): Alone Assessment

The Secretary of State identified a potential LSE on puffin (breeding season and non-breeding season (all birds)), guillemot and razorbill (breeding season (immature birds) non-breeding season (all birds)) from displacement from the operational phase of the Project and disturbance from construction/decommissioning. The Applicant assumes displacement resulting from operational activities of Hornsea Three presents the worst case scenario with respect to overall disturbance impacts. Therefore, the analysis of disturbance during construction/decommissioning is treated equivalently to the assessment of displacement.

5.3.7.1 Puffin

The Applicant submitted that the mean foraging range for puffin is 4 km from a bird colony during breeding season while the mean maximum range is 105.4 km and highest maximum reported 200 km (Thaxter *et al*., 2012)[54]. Consequently, puffins in the Project area in summer are likely to be predominantly over-summering young immature birds rather than breeding adults from the Humberside colonies (which are over 100 km from the Project area).

The mean-maximum foraging range (±1 standard deviation) from Thaxter *et al*. (2012) partially overlaps to a minimal extent with the Project Area only when 1 standard deviation is taken into account. The Applicant therefore concludes that there is very limited likelihood of connectivity between the colony and the Project array area.

However, NE emphasised the potential connectivity between the Proposed Development and the site in the breeding and non-breeding seasons for puffin [REP1-212]. The ExA considered NE's position but did not find it to be of sufficient weight to alter the conclusions of the ES or RIAA.

The Applicant considers it likely that a large proportion of the immature population at Hornsea Three will originate from those breeding colonies that are closest to Hornsea Three including the Flamborough and Filey Coast SPA, the Farne Islands (39,962 occupied burrows in 2013), Coquet Island (12,344 occupied burrows in 2013) and the Firth of Forth (51,991 equivalent pairs in 2013). These breeding colonies are much larger than Flamborough and Filey Coast SPA (980 pairs) and as such would have larger associated populations of immature birds. Therefore, any apportioning of impacts from the Project to the total population of immatures present at Hornsea Three would result in a negligible proportion being apportioned to the SPA.

The Applicant submitted supplementary aerial survey data collected between January and March 2019 that showed population estimates of puffin recorded in 2019 were higher in February compared to the same period in 2017, but slightly lower in March. No puffins were recorded at Hornsea Three plus a 4 km buffer during January 2017 or January 2019. The estimated mean peak population during the pre-breeding period increased from the original estimate of 127 individuals to 137 individuals with the inclusion of the supplementary data. Although the pre-breeding population has increased following the collection of supplementary data, the level of mortality arising from displacement remains unchanged.

No displacement mortality is predicted to occur during breeding or non-breeding season in adults or immature puffins from the Flamborough and Filey Coast SPA [APP-051, REP5-014] (Ørsted 2019)[55].

NE and the RSPB raised concerns about the way seasons were defined in the calculation of the mean seasonal peaks and recommended an extended breeding season. This would have increased the

[54] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S., Roos, S., Bolton, M., Langston, R.H. and Burton, N.H. (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation*, 156, p. 53-61.

[55] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019

displacement mortality for breeding puffin. This issue was discussed for CRM (see Section 4.3.1) and in line with their recommendation for CRM, the ExA does not recommend the use of the extended breeding season.

5.3.7.2 Guillemot

The Applicant used a mean foraging range for breeding guillemots of 37.8 km and a mean-maximum range is 84.2 km (highest maximum reported 135 km) from (Thaxter *et al*., 2012)[56].

The Applicant assumed apportioning values of 4.4% of breeding birds from the SPA to the Project area in the non-breeding season and none in the breeding season. These approaches are consistent with assessments for the Hornsea Two project.

The RSPB initially disagreed with the exclusion of the non-breeding guillemot and razorbill populations on the Flamborough and Filey Coast SPA [REP2-012]. However, the Applicant submitted further information [REP5-014] which resolved the RSPB concerns notwithstanding the ornithology baseline data issues, as set out in the final Statement of Common Ground [REP9-029]. NE also concluded that the assessment was reasonable provided 100% of immature birds were apportioned [REP6-054].

The Applicant submitted supplementary aerial survey data collected between January and March 2019 that showed population estimates of guillemot recorded in 2019 were higher in January and February compared to the same period in 2017, but lower in March. The estimated mean seasonal peak populations remain unchanged and, consequently, the predicted level of mortality arising from displacement remains unchanged (Ørsted 2019) [57].

The peak guillemot population estimate within the Project Area and 2 km buffer during the non-breeding season that can be apportioned to the SPA is 784 birds. Displacement analysis predicts mortality of four breeding adult guillemot in the non-breeding season based on a displacement rate of 50% and a mortality rate of 1%.

Displacement analysis predicts mortality of four adult guillemot in the non-breeding season based on a displacement rate of 50% and a mortality rate of 1% [APP-051].

Displacement analysis predicts mortality of 53 immature guillemot in the pre-breeding season and three in the non-breeding season based on a displacement rate of 50% and a mortality rate of 1% [REP5-014].

Therefore, breeding adult guillemot lost to the SPA population as a result of displacement represent 0.005% of the SPA breeding population (41,607 pairs) and would result in a negligible change in background mortality of 0.08%. The estimated total loss of 60 guillemots (including immatures) represents a loss of 0.07% of the breeding population and a change in baseline mortality of 1.2%.

5.3.7.3 Razorbill

The Applicant used a mean foraging range for breeding guillemots of 23.7 km and a mean-maximum range is 48.5 km (highest maximum reported 95 km) from (Thaxter *et al*., 2012)[58].

[56] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S., Roos, S., Bolton, M., Langston, R.H. and Burton, N.H. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, 156, p. 53-61.

[57] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

[58] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S., Roos, S., Bolton, M., Langston, R.H. and Burton, N.H. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation*, 156, p. 53-61.

This leads the Applicant to hypothesise that any razorbills at the Project area in the breeding season are likely to be over-summering young immature birds originating from various colonies along the east coast of England and Scotland, rather than breeding adults from the Humberside colonies (which are over 100 km from Hornsea Three).

The Applicant submitted supplementary aerial survey data collected between January and March 2019 that showed population estimates of razorbill recorded in 2019 were higher in January and February compared with the same period in 2017, but marginally lower in March. The estimated mean peak population during the pre-breeding season increased from 1,236 individuals to 2,062 (Ørsted 2019) [59]. Displacement analysis indicated that this increase in density from two years of data increased the estimated mortality during the pre-breeding period from zero to one.

The Applicant applied a displacement value of 40% from the Project area and a 2 km buffer during the breeding, post-breeding and non-breeding seasons for razorbill reflecting a degree of precaution based on a lower level of empirical evidence compared to other species. Mortality rates used were: 2-10% (breeding season), 2% (post- and pre-breeding seasons) and 1% (non-breeding season).

Displacement analysis predicts mortality of less than one adult razorbill in the non-breeding season based on a displacement rate of 40% and a mortality rate of 1% [APP-051].

Displacement analysis for razorbill predicts mortality of one adult razorbill in the pre-breeding season based on a displacement rate of 40% and a mortality rate of 2% (Ørsted 2019)[60].

For immature birds, displacement analysis predicts mortality of three immature razorbill in the non-breeding seasons based on a displacement rate of 50% and a mortality rate of 1% [REP5-014].

The breeding population of razorbill at Flamborough and Filey Coast SPA is 10,570 pairs. The potential loss of less than five birds in no more than 0.02% of SPA population.

5.3.7.4 Conclusion

The Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant. He has considered the representations made by the Applicant, NE and the RSPB (including those made subsequent to Examination) and the recommendations made by the ExA. The Secretary of State is satisfied that the potential increased Auk displacement and disturbance as a result of the Project alone would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

5.3.8 Auk Species: In Combination Assessment

5.3.8.1 Puffin

The Applicant considers there to be no predicted mortality of puffin associated with the breeding colony of the SPA as a result of displacement from the Project in any biological season. Therefore, the Project will not materially affect the current predicted in-combination impact for puffin from the SPA.

5.3.8.2 Guillemot

The Applicant considers there to be no predicted mortality of breeding adult guillemot associated with the breeding colony of the SPA as a result of displacement from the Project in the breeding season. The current level of in-combination displacement mortality in the breeding season from Tier 1 offshore wind

[59] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

[60] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019

farms is considered to be between 36-181 birds and for Tier 2 wind farms is 118-590 birds; depending on the level of mortality [APP-051].

The Applicant notes that the number of guillemot at the SPA has increased considerably in recent years with an observed rate of increase of approximately 3.2% between 1987 and 2017.

Based on the Applicant's modelled impacts of 50 and 200 guillemots, the median growth rate would be expected to decline by 0.06-0.26%. The resulting SPA population of guillemot after 35 years would (when applying the NE recommended approach of using 'matched pairs' in the population modelling) be expected to represent 92.1 and 98.0% of the population that would occur without the presence of in combination wind farms. A density dependent model predicted a lesser change in growth rate, approximately 0.03-0.12% and consequently a higher ratio of impacted to unimpacted median population size after 35 years (96.5-99.1%) [REP1-135].

During the non-breeding season in-combination displacement arising from Tier 1 projects potentially affects 2,426 birds, which leads to mortality of 12 individuals (assuming displacement of 50% and mortality of 1%). If Tier 2 projects are included, the number of birds affected is 3,630, which leads to mortality of 18 individuals (assuming displacement of 50% and mortality of 1%). The predicted mortality comprises 0.022% of the SPA breeding population (41,607 pairs) and an increase in baseline mortality (5,076 individuals) of 0.35%.

For immature birds, displacement analysis predicts mortality of nine immature guillemot in the non-breeding season based on a displacement rate of 50% and a mortality rate of 1%.

5.3.8.3 Razorbill

The Applicant considers there to be no predicted mortality of breeding adult razorbill and only a negligible predicted mortality for immature razorbill associated with the breeding colony of the SPA as a result of displacement from the Project in any biological season. Therefore, the Project will not materially affect the current predicted in-combination impact for razorbill from the SPA.

5.3.8.4 Conclusion

The Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant, particularly those explored in Section 4.3. He has considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA. The Secretary of State is satisfied that the potential increased Auk mortality as a result of the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

5.3.9 Fulmar: Alone Assessment

The Secretary of State identified a potential LSE on fulmar (in all seasons) from displacement from the operational phase of the Project.

Fulmar is included as a listed assemblage feature as part of the designation for the SPA with a population of 1,447 pairs as detailed in the Departmental Brief for the SPA (Natural England 2014)[61].

[61] Natural England (2014). *Departmental brief: Proposed extension to Flamborough Head and Bempton Cliffs Special Protection Area and renaming as Flamborough and Filey Coast potential Special Protection Area (pSPA)*. Natural England.

Fulmar have an extensive foraging range in the breeding season with Thaxter *et al*. (2012)[62] reporting a mean-maximum foraging range of 400 km. This therefore suggests connectivity between birds from the SPA and Project area. In addition to the SPA there are also further colonies located on the east coast of the UK from which the foraging range of fulmar interacts with Hornsea Three.

The mean-peak fulmar population estimate within the Project area and 2 km buffer during the breeding season that can be apportioned to the SPA is 303 birds. Displacement analysis for fulmar predicts mortality of up to two fulmars in the breeding season based on a displacement rate range of 10-30% and a mortality rate of 2%. Therefore, birds lost to the population as a result of displacement represent 0.02-0.06% of the SPA breeding population (1,447 pairs) and would result in a 0.33-0.98% increase in background mortality (185 individuals) [APP-051].

Within the application it was predicted that there would be no fulmar mortalities outwith the breeding period. Subsequent analysis incorporating additional aerial survey data obtained between January and March 2019 reported a higher numbers of fulmars during the pre-breeding period than has previously been assessed and therefore could increase the predicted number of birds impacted during this period. However, further displacement analysis indicated that there would be no increase in displacement mortality (Ørsted 2019)[63].

The Applicant concludes that due to the low percentage of the SPA population affected by displacement and, the small increase in background mortality it is assessed that there is no adverse effect on the integrity of the fulmar population of the FFC SPA as a result of displacement mortality due to operation and maintenance activities.

The Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant. He has considered the representations made by the Applicant, NE and the RSPB and the recommendations made by the ExA. The Secretary of State is satisfied that the potential increased fulmar displacement mortality as a result of the Project alone would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

5.3.10 Fulmar: In Combination Assessment

The Applicant considers that there is little quantitative information on the potential displacement of fulmar from other wind farm projects that may act in-combination with Hornsea Three and that the Project is unlikely to contribute a significant amount of additional mortality relative to the amount that may already occur in combination. i.e. displacement mortality in the breeding season is up to two birds with less than one bird estimated for the post-, non- and pre-breeding seasons.

Therefore, while Secretary of State recognises the methodological disagreements between NE, the RSPB and the Applicant, particularly those explored in Section 4.3, he is satisfied that the very small potential for increased fulmar displacement mortality as a result of the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Flamborough and Filey Coast SPA.

[62] Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S., Roos, S., Bolton, M., Langston, R.H. and Burton, N.H. (2012) Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. *Biological Conservation*, 156, p. 53-61.

[63] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019.

5.4 Appropriate Assessment: Greater Wash SPA

The Greater Wash SPA is located between Bridlington Bay, East Yorkshire and the area just north of Great Yarmouth on the Norfolk coast. The SPA has a landward boundary at Mean High Water and an offshore extent of around 30 km at its furthest point. The site was classified in March 2018 and covers an area of approximately 3,536 km^2

When the SPA was designated, six features were identified (Natural England and JNCC, 2016)[64].

The bird features fall into three categories:

- Annex I Tern species that use relatively restricted areas around their breeding colonies for foraging;
- Non-breeding Annex I species; and
- Non-breeding regularly occurring migratory species.

Annex I Tern species include Sandwich tern, common tern and little tern. The non-breeding Annex I species are red-throated diver and little gull and the regularly occurring migratory species are common scoter.

NE published conservation objectives for the Greater Wash SPA[65]. These are set out in Table 7.

Table 7: Conservation objectives for the Greater Wash SPA.

Conservation Objectives	The objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; • The extent and distribution of the habitats of the qualifying features, • The structure and function of the habitats of the qualifying features, • The supporting processes on which the habitats of the qualifying features rely, • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect is likely.

5.4.1 Common Scoter: Alone Assessment

The Secretary of State identified a potential LSE on common scoter from displacement from the operational phase of the Project and disturbance from construction/decommissioning.

The Applicant undertook digital aerial surveys along the cable corridor plus a 4 km buffer and recorded no common scoter. Therefore, they conclude that there is no pathway between common scoter and the Project area.

[64] Natural England and JNCC (2016) Departmental Brief: Greater Wash potential Special Protection Area. [Online]

[65] http://publications.naturalengland.org.uk/publication/4597871528116224.

Lawson *et al*. (2015)[66] showed that the distribution of common scoter in the Greater Wash SPA is limited and consistently restricted to specific areas. The cable route runs through the Greater Wash SPA making landfall near Weybourne on the North Norfolk coast, at least 35 km east of the highest densities of common scoter which are located in the mouth of The Wash. It should also be noted that the export cable route runs through an area of high vessel activity associated with vessel movements adjacent to the north-east coast of Norfolk.

During the operation and maintenance phase of Hornsea Three, disturbance may occur as a result of vessel traffic associated with operation and maintenance activities at the Project array area. Common scoter is considered to have a high sensitivity to disturbance from vessels.

As mentioned above, Lawson *et al*. (2015) indicate that the area of the Greater Wash SPA through which vessels will likely transit does not contain notable densities of common scoter. The effects of displacement on common scoter in the operational phase are considered highly likely to be at a lower level of magnitude to that described during the construction phase. Therefore, it is considered extremely unlikely that maintenance activities in the export cable route will result in any increase in disturbance effects on common scoter when compared to the level of disturbance already considered to be part of the baseline environment.

Given the limited connectivity between the export cable route and identified high density areas of common scoter, and the lack of birds identified in digital aerial surveys, the Secretary of State having considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA, is satisfied that the potential increased common scoter displacement and disturbance Project alone would not represent an adverse effect upon the integrity of the Greater Wash SPA.

5.4.2 Common scoter: In combination Assessment

The Applicant has predicted that Tier 1 projects which could overlap with the construction of Hornsea Three are the Dogger Bank Zone projects (Creyke Beck A & B, Teesside A and Sofia (formerly Dogger Bank Teesside B)). Disturbance events during construction activities may disturb and displace birds for the duration of the construction period. The Applicant therefore concludes that, as construction activities will be focused at specific locations within the Project array area, it is expected to lead to a displacement impact of lesser magnitude than that predicted during operation and maintenance.

The construction of the offshore components of the Project will occur over a maximum duration of eight years, assuming a two phase construction scenario. A gap of three years may occur between the same activity in each phase and so having the consequence that the construction period is considered to be of medium-term duration (as birds may return to areas when activities are not currently occurring).

It was assumed by the Applicant that construction and cable laying activities associated with the Dogger Bank projects would be unlikely to originate in the Greater Wash area and are, therefore, unlikely to affect areas within the Greater Wash known to support relatively high densities of common scoter given the distance between the Dogger Bank projects and ports adjacent to the Greater Wash SPA.

In addition to the Tier 1 projects considered above, those Tier 2 projects predicted to overlap with the construction of Hornsea Three are East Anglia Zone projects (Norfolk Vanguard and East Anglia Three).

Of these projects, the Applicant only anticipated that the construction of Norfolk Vanguard (export cable) would potentially lead to disturbance common scoter population of the Greater Wash SPA. The Norfolk Vanguard project determined that there would be no likely significant effect on common scoter on the basis of there being limited, if any, interaction between the project and the areas within the SPA that

[66] Lawson, J., Kober, K., Win, I., Allcock, Z., Black, J., Reid, J.B., Way, L. and O'Brien, S.H. (2015). *An assessment of the numbers and distributions of wintering red-throated diver, little gull and common scoter in the Greater Wash.* JNCC Report 574. Peterborough: JNCC.

common scoter occur [67]. During Examination both NE and the ExA agreed that there would be no adverse effect on common scoter from Norfolk Vanguard project alone or in-combination.

Regarding displacement from the operational phase of the Project the Applicant submits that vessels involved in the operation and maintenance of wind farms located in the Greater Wash (including Lincs, Lynn, Inner Dowsing, Race Bank, Sheringham Shoal. Humber Gateway and Westermost Rough), the former Hornsea Zone and Dogger Bank will be likely to transit the Greater Wash SPA.

Vessel movements associated with operation and maintenance of offshore wind farms will largely occur within areas that are already substantially utilised by vessels. Any displacement impacts associated with vessel movements to and from the Project are considered to represent a negligible increase in current baseline levels.

Given the reasoning above, the Secretary of State having considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA, is satisfied that the potential increased common scoter displacement and disturbance from the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Greater Wash SPA.

5.4.3 Red-throated diver: Alone Assessment

The Secretary of State identified a potential LSE on red-throated diver from displacement from the operational phase of the Project and disturbance from construction/decommissioning.

Red-throated diver have the potential to be disturbed from the Project's export cable corridor.

The Applicant considers that the effects associated with export cable installation are expected to be highly localised as cable laying vessels are slow moving during the installation of cables and that cable laying activity will be intermittent and therefore any displacement will be temporary and short term in nature.

The main concentrations of red-throated diver in the Greater Wash are located off the north Norfolk coast and the Lincolnshire coast, around Gibraltar Point with densities of up to 3.38 birds/km^2 occurring in these areas. The cable route runs through an area of relatively low densities, when compared to densities elsewhere in the Greater Wash with densities of up to 0.46 birds/km^2 possible along the cable route.

The Applicant calculates that the mean-peak density of red-throated diver within the export cable route plus a 2 km buffer 0.19 birds/km^2. If it is assumed that 100% of birds are within the area in which construction activities will occur (113.1 km^2), it is predicted that 21 birds would be displaced during the installation of the export cable. As the presence of vessels in an area is temporary it is assumed that birds will soon return to the area from which they were displaced therefore reducing the temporal extent of the impact.

The Applicant predicted red-throated diver mortality of less than one bird (based on 1% mortality rate – approximately two birds with a 10% mortality). The magnitude of this impact is considered to be insignificant as it represents 0.01% (0.02% for 10% mortality) of the Greater Wash SPA population of red-throated diver and a very slight increase of 0.08% in the baseline mortality of that population.

The RSPB highlights that there is emerging information, particularly from German studies of even higher displacement of red-throated diver from offshore windfarms. It also stresses the incomplete baseline and that this conclusion is only tentative. Regardless, it agrees that there would not be a significant impact on these species [REP9-029].

Lawson *et al*. (2015) indicates that the area of the Greater Wash SPA through which vessels will likely transit does not contain notable densities of red-throated diver. The effects of displacement on red-

[67] Norfolk Vanguard Limited (2018). Norfolk Vanguard Offshore Wind Farm Information for the Habitats Regulations Assessment.

throated diver in the operational phase are likely to be at a significantly lower level of magnitude to that described during the construction phase (above) as the level of activity associated with the export cable is significantly reduced. It is considered extremely unlikely that maintenance activities at the Hornsea Three export cable route will result in any increase in disturbance effects on red-throated diver when compared to the level of disturbance already considered to be part of the baseline environment.

Therefore, the Secretary of State having considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA, is satisfied that the potential increased red-throated diver displacement and disturbance from the Project alone would not represent an adverse effect upon the integrity of the Greater Wash SPA.

5.4.4 Red-throated diver: In combination Assessment

As per the common scoter in combination assessment (above), the Applicant has predicted that Tier 1 projects which could overlap with the construction of Hornsea Three are the Dogger Bank Zone projects (Creyke Beck A & B, Teesside A and Sofia (formerly Dogger Bank Teesside B)). Disturbance events during construction activities may disturb and displace birds for the duration of the construction period. The Applicant therefore concludes that, as construction activities will be focused at specific locations within the Project array area, it is expected to lead to a displacement impact of lesser magnitude than that predicted during operation and maintenance.

In addition to the Tier 1 projects considered above, those Tier 2 projects predicted to overlap with the construction of Hornsea Three are East Anglia Zone projects (Norfolk Vanguard and East Anglia Three).

Of these projects, the Applicant only anticipated that the construction of Norfolk Vanguard (export cable) would potentially lead to disturbance of red-throated diver population of the Greater Wash SPA. The Secretary of State notes that during Examination of the Norfolk Vanguard project it was concluded by the ExA that there would be no adverse effect on the integrity of the site both alone and in-combination.

As per the common scoter in combination assessment, the Applicant submits that vessels involved in the operation and maintenance of wind farms located in the Greater Wash (including Lincs, Lynn, Inner Dowsing, Race Bank, Sheringham Shoal. Humber Gateway and Westermost Rough), the former Hornsea Zone and Dogger Bank will be likely to transit the Greater Wash SPA. Therefore, vessel movements associated with operation and maintenance of offshore wind farms will largely occur within areas that are already substantially utilised by vessels. Any displacement impacts associated with vessel movements to and from the Project are considered to represent a negligible increase in current baseline levels.

Given the reasoning above, the Secretary of State having considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA, is satisfied that the potential increased red-throated diver displacement and disturbance from the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Greater Wash SPA.

5.4.5 Sandwich tern: Alone Assessment

The Secretary of State identified a potential LSE on Sandwich tern from disturbance and changes to prey availability from construction/decommissioning.

As noted for common scoter (above), the nature of cable laying activities (highly localised, slow moving vessel, low noise levels and limited spatial extent of impact) will also reduce the likelihood of impacts on Sandwich tern.

The Applicant considered that the extent of any impact due to construction activities will extend no further than the close proximity around disturbance sources associated with the export cable. Therefore, Sandwich tern is likely to be largely unaffected by disturbance.

The predicted usage of the export cable route by Sandwich terns from the breeding colony at Blakeney Point is low with areas of higher usage located much closer to the colony. As such, the Applicant considers that even if disturbance were to occur, it would affect a limited number of birds in an area that is of limited importance for foraging when compared to other areas.

Sandwich tern is considered to be a species with a low sensitivity to vessel and helicopter disturbance (Wade *et al*., 2016)[68] with the species seemingly tolerant of human activities at sea.

Regarding prey availability, the predicted usage of the export cable route by Sandwich tern is considered by the Applicant to be low with the majority of foraging areas used by Sandwich terns from Blakeney Point, including those of high usage, unaffected by construction activities associated with the export cable route.

The ES volume 2, chapter 3: Fish and Shellfish Ecology, assessed the potential effects of construction impacts on the prey species of Sandwich tern and determined that these impacts represented a significance of no more than minor. Sandwich tern is considered to have a moderate habitat use flexibility meaning that the species is, to some extent, able to respond to changes in habitat conditions.

Therefore, the Secretary of State having considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA, is satisfied that the potential increased Sandwich tern disturbance and changes to prey availability from the Project alone would not represent an adverse effect upon the integrity of the Greater Wash SPA.

5.4.6 Sandwich tern: In combination Assessment

As per the common scoter and red-throated diver assessments, the Applicant considers that displacement from construction and decommissioning activities in combination with other plans and projects would cause no adverse effect on the integrity of the Sandwich tern population of the SPA due to the limited temporal span and localised effect of the installation of the export cable, combined with the relatively low densities of sandwich tern along the cable route [APP-051]).

Similarly, the Applicant's assessment indicates that changes to prey availability caused by construction and decommissioning activities would cause no adverse effects on the integrity of Sandwich tern populations and insignificant effects on its prey resources in the Greater Wash SPA since there is a limited temporal span and localised level effect of export cable installation and relatively low usage of the export cable route by Sandwich tern.

Therefore, the Secretary of State having considered the representations made by the Applicant, NE and the RSPB and the recommendation as made by the ExA, is satisfied that the potential increased Sandwich tern displacement and changes to prey availability from the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Greater Wash SPA.

5.5 Appropriate Assessment: North Norfolk Coast SPA/Ramsar Site

The North Norfolk Coast SPA was classified in January 1996. It is a coastal site covering an area of approximately 78.87 km^2. The Ramsar Site was designated in January 1976 and covers a similar area of approximately 78.62 km^2. These overlapping designations are situated east of The Wash, along the northern coastline of Norfolk. They encompass approximately 40 km of coastline from Holme to

[68] Wade H.M., Masden. E.A., Jackson, A.C. and Furness, R.W. (2016) Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. *Marine Policy*, 70, 108–113.

Weybourne and comprise a wide variety of coastal and intertidal habitats [REP1-213]. They are located approximately 0.32 km from the onshore cable corridor [APP-051].

The North Norfolk Coast Ramsar site is a notable example of marshland coast with intertidal sand and mud, saltmarshes, shingle banks and sand dunes, brackish-water lagoons and extensive areas of freshwater grazing marsh and reed beds. The site also supports at least three British Red Data Book and nine nationally scarce vascular plants, one British Red Data Book lichen and 38 British Red Data Book invertebrates.

The onshore cable corridor is located approximately 0.32 km from the North Norfolk Coast Ramsar with greater distances to permanent infrastructure.

Natural England considers the Conservation Advice packages for the overlapping European site designations to be, in most cases, sufficient to support the management of the Ramsar interests. As such the Conservation Objectives of the North Norfolk Coast SPA are applied to the Ramsar site.

5.5.1 Features screened into assessment.

The North Norfolk Coast SPA encompasses much of the northern coastline of Norfolk in eastern England. It is a low-lying barrier coast that extends for 40 km from Holme to Kelling Hard and includes a variety of coastal habitats. The main habitats – found along the whole coastline – include extensive intertidal sand- and mud-flats, saltmarshes, shingle and sand dunes, together with areas of freshwater grazing marsh and reedbed, which has developed in front of rising land.

NE published conservation objectives for the North Norfolk Coast SPA[69]. These are set out in Table 8.

Table 8: Conservation objectives for the North Norfolk Coast SPA.

Conservation Objectives	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • the extent and distribution of the habitats of the qualifying features • the structure and function of the habitats of the qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features • the distribution of qualifying features within the site

The features screened into the assessment, with respect to all likely significant effects, are the representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region; notably brackish-water lagoons and habitats supporting British Red Data Book and nationally scarce vascular plants, British Red Data Book lichen and British Red Data Book invertebrates.

The Secretary of State also identified potential impacts on the overwintering bird assemblage and passage population of knot, over-wintering population of dark-bellied Brent goose, knot, pink-footed goose, pintail and wigeon

[69] https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9009031&SiteNamenorth%20norfolk&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&HasCA=1&NumMarineSeasonality=11&SiteNameDisplay=North%20Norfolk%20Coast%20SPA#hlco

During the course of the examination it was agreed by interested parties and the Applicant that there would not be an adverse effect on the integrity of all Annex I habitat, Annex II species and onshore ecology features of the North Norfolk Coast SPA/Ramsar [REP1-218] [REP9-029]

The qualifying features that fall to be considered are pink-footed goose (overwintering), and pink-footed goose under Criterion 6.

5.5.2 Pink-footed goose: Alone Assessment

The onshore cable corridor is located 0.32 km from the SPA and as such would avoid permanent habitat loss within the North Norfolk Coast SPA or Ramsar site.

Pink-footed geese use land that is functionally linked to the SPA/RAMSAR within the onshore cable corridor to feed on post-harvest sugar beet. Within the functionally linked land, permanent habitat loss will occur where sugar beet fields are replaced with concrete and other manmade materials. The total area of functionally linked sugar beet fields varies from year to year.

The Applicant considers that these areas are not significant compared to the total sugar beet production along the North Norfolk Coast and that the proposed design measures will avoid permanent habitat loss within functionally linked land associated with the North Norfolk Coast SPA.

In most cases the onshore export cable will be buried to a depth of 1.2 m below ground level, with sections of the cable joined together at 9 m x 25 m jointing pits spaced at least 750 m apart with an associated 3 m x 3 m link box at each junction bay.

Therefore, the associated habitat loss within the functionally linked land area between Weybourne and Kelling Heath, resulting from the manhole access to the jointing pits and link boxes, will be a very small fraction of the potential 10,749.5 ha of functionally linked land.

The Applicant's assessment indicates that there would be no adverse effects on the population or distribution of pink-footed geese arising from the temporary loss of functionally linked land because this species is highly mobile and has the capacity to take advantage of food resources beyond the area that would be influenced by the onshore cable corridor [APP-051].

The Applicant considers that if construction works were to take place on functionally linked sugar beet fields used for foraging between November and January then a pink-footed goose mitigation plan [REP9-062], used in combination with standard light and noise mitigation measures, would avoid or minimise the risk of disturbance [APP-051].

The Applicant proposes two steps to the mitigation plan:

- First, pre-construction surveys and investigations will be undertaken to determine the extent of disturbance likely to occur due to construction activities. This will include a survey of the distribution and abundance of pink-footed geese and the distribution of harvested sugar beet within those sections of the Hornsea Three onshore cable corridor (and a 500 m disturbance buffer) likely to be affected during the winter season within which works will take place; and
- Second, if required, measures to reduce disturbance or provide alternative foraging habitat will be implemented sufficient to reduce the effects of disturbance to an acceptable level. The measures will be proportionate to the predicted impact at the time of construction and will be effective and agreed with Natural England prior to implementation.

The Applicant views these measures as sufficient to mitigate any adverse effect on the SPA.

NE and RSPB raised a number of concerns during the course of the Examination relating to the baseline survey [REP1-111], energetic costs of using alternative foraging areas [REP3-074], level of detail in the Outline CoCP [REP2-012 and REP5-027], need for a 12 month preparatory period [REP1-111], consultation procedures [REP1-207 and REP1-213], effect of potential construction delays [REP3-007

and REP3-074], co-operation of landowners [REP2-012], availability of additional refuge provision outside the zone of influence [REP2-012, REP3-007 and REP3-074] and the provision of post-harvest of sugar beet on functionally-linked foraging land [REP5-027].

All outstanding matters relating to RSPB's concerns were resolved by the end of the Examination [REP9-029]. However, this was not the case for NE which has a number of outstanding concerns relating to the definition of the overwintering period, robustness of the decision-making process, definition of periods when geese would be most sensitive, when mitigation would be triggered, level of detail of work restrictions and the extent of sugar beet planting within the cable corridor [REP9-022].

NE state that the potential requirement for pink-footed goose mitigation outside the peak overwintering period is shown on its online "Designated Sites View Package" [REP9-022]. However, as this evidence was not directly submitted for inclusion in the Examination Library, the ExA were unable to take it into account.

The Secretary of State does not consider the omission of the Designated Sites View Package by NE to be material to decision making in this case; and despite the omission, the Applicant committed to monitoring the pink-footed geese between October and March in the Outline Environmental Monitoring Plan [REP9-065]. This would allow the Applicant to respond any changes in peak abundance of pink-footed geese that might occur [REP7-007].

The ExA note that a suitably qualified Ecological Clerk of Works at the onshore cable corridor construction site would make construction teams aware of the potential presence and disturbance impact pathways for pink-footed geese. All personnel would be trained to identify flocks of grey goose species so that they would be able to raise any perceived risks with the Ecological Clerk of Works.

The ExA were satisfied that this approach would adequately manage the risk to the integrity of the site.

Regarding the predicted area of post-harvest sugar beet within the zone of influence that would trigger mitigation, NE has advised that this should be associated with a 25% loss of post-harvest sugar beet as a result of the Project rather than a 50% loss as suggested by the Applicant. However, the ExA note that the available food resource is extensive, and that the population has consequently been extending eastwards from its core which suggests that food limitation is not an issue at the current time and that there would be sufficient alternative feeding areas to compensate for the relatively small area that would be affected by a 50% loss.

The ExA also note that NE has not provided evidence that would support the adoption of a lower threshold.

Based on the above, including the extension of the period over which a mitigation plan will be used to October to March, and recognising the methodological disagreements between NE, and the Applicant, the Secretary of State is satisfied that the potential for impacts on pink-footed geese as a result of the Project alone would not represent an adverse effect upon the integrity of the North Norfolk Coast SPA/RAMSAR.

5.5.3 Pink-footed goose: In Combination Assessment

The Applicant presented a tiered approach to the in combination assessment in line with that set out in Section 4.3.3. This approach groups projects by the likelihood of being built.

The assessment considered the potential impacts the Project during construction, operation and maintenance and decommissioning, in combination with other relevant plans and projects with respect to the site's Conservation Objectives. Only the export cable and associated access infrastructure are considered to be located near enough to in combination impact pathways to exist.

All Tier 2 residential and commercial developments are located south of the A47 with no reasonably foreseeable in combination impact pathway to any European site when taking into account their location.

For Tier 3 developments, an in combination impact pathway exists between the Project and Norfolk Vanguard at Booton Common where the two cables routes are roughly perpendicular.

As the Norfolk Vanguard application is being taken through the planning system at a similar rate to the Project, there is potential for an overlap of the construction periods in relation to the onshore cabling work but any overlap in impacts would be restricted to areas outside of the North Norfolk Coast SPA/RAMSAR or any functionally linked land.

The ExA recommend that there would be no adverse effect on the integrity of the SPA in combination with other plans or projects.

Given the lack of potential concurrent plans or projects the Secretary of State is satisfied that the potential increased pink-footed goose displacement from the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the North Norfolk Coast SPA.

5.6 Appropriate Assessment: North Norfolk Sandbanks and Saturn Reef SAC

The North Norfolk Sandbanks and Saturn Reef SAC is a marine site that was designated in September 2017 and covers are area of approximately 3,603 km^2. It is located approximately 40 km off the north Norfolk coast and extends to approximately 110 km offshore. It comprises the most extensive area of offshore linear ridge sandbanks in the UK and has sandy sediments that support sparse infaunal communities of polychaete worms, isopods, crabs and starfish.

The North Norfolk Sandbanks are the most extensive example of the offshore linear ridge sandbank type in UK waters. They are subject to a range of current strengths which are strongest on the banks closest to shore and which reduce offshore. The sandbank structures are maintained through offshore sediment transport, with each bank acting as a stepping stone, and the development of new sandbanks between existing banks. The designated boundary of the site encompasses the whole linear sandbank system rather than attempting to separate out individual banks.

The outer banks are the best example of open sea, tidal sandbanks in a moderate current strength in UK waters. Sandwaves are present, being best developed on the inner banks; the outer banks having small or no sandwaves associated with them. They extend from about 40 km (22 nautical miles) off the north-east coast of Norfolk out to approximately 110 km (60 nautical miles).

The biological communities present on the sandbanks are representative of the infralittoral mobile sand biotope. Species typical of this biotope include the polychaete worm *Nephtys cirrosa* and the isopod *Eurydice pulchra*. Over 85 species of invertebrates colonise the sediment including 45 species of polychaete worms and 10 bivalve molluscs. The subtidal sandbanks also provide important nursery grounds for young commercial fish species, including plaice *Pleuronectes platessa*, cod *Gadus morhua* and sole *Solea solea*.

The SAC would overlap with approximately two thirds of the export cable corridor [APP-051].

Table 9 shows the Conservation objectives for the North Norfolk Sandbanks and Saturn Reef SAC which were released by the JNCC in December 2017[70].

[70] http://data.jncc.gov.uk/data/d4c43bd4-a38d-439e-a93f-95d29636cb17/NNSSR-2-Conservation-Objectives-v1.0.pdf

Table 9: Conservation objectives for the North Norfolk Sandbanks and Saturn Reef SAC

Conservation Objectives	For the features to be in favourable condition thus ensuring site integrity in the long term and contribution to Favourable Conservation Status of Annex I Sandbanks which are slightly covered by sea water all of the time and Annex I Reefs. This contribution would be achieved by maintaining or restoring, subject to natural change: • The extent and distribution of the qualifying habitats in the site; • The structure and function of the qualifying habitats in the site; and • The supporting processes on which the qualifying habitats rely.

The conservation status of the site is not favourable at the current time and the objective for this site is to restore these features to favourable condition by restoring their extent and distribution, structure and function and any supporting processes upon which they rely.

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect is likely.

5.6.1 Annex I Reef: Alone Assessment

The Secretary of State identified LSE for Annex I biogenic reef features of the SAC comprising the polychaete worm *sabellaria spinulosa*.

The Applicant submits that although the offshore cable corridor coincides with the JNCC delineated boundary of Sabellaria spinulosa reef in the North Norfolk Sandbanks and Saturn Reef SAC, no Annex I reefs were identified during the site specific surveys of the Hornsea Three offshore cable corridor coinciding with the North Norfolk Sandbanks and Saturn Reef SAC.

As discussed in ES (volume 2, chapter 2), the Applicant determined the risk of Annex I reef being present in the part of the SAC coinciding with the offshore cable corridor prior to construction by using the core reef approach. The core reef approach provides a means of predicting areas where reef is most likely to occur.

Although no areas of core reef were identified within the offshore cable corridor, the Applicant adopted a precautionary approach whereby potential future Annex I reef not qualifying as core reef within the offshore cable corridor was included in the assessment.

The Applicant also states that even if the primary mitigation of avoiding reefs where possible fails and export cables need to be installed through an area of reef(s), the cables would still be microsited through areas of lower quality reef, avoiding areas of medium or high quality reef.

The impact of temporary loss or disturbance from cable installation on reef features of the SAC is predicted by the Applicant to be localised to discrete sections of the offshore cable corridor, of medium-term duration (i.e. construction phase three years over a span of up to eight years), intermittent and reversible.

The Applicant considers the magnitude of any impact to be minor for the following reasons:

- The low risk of Annex I reefs occurring within the Hornsea Three offshore cable corridor;
- The primary mitigation for Annex I reefs is to avoid these entirely, where possible;
- The high likelihood that this primary mitigation measure will be effective as the offshore cable corridor is of sufficient width to allow cables to be microsited around reefs in all but the most unlikely potential future Annex I reef scenarios; and
- In the event that cable installation within Annex I reefs is unavoidable (e.g. due to practical or engineering constraints), the cables would be microsited through areas of lower quality reef,

avoiding areas of medium or high quality reef and/or cable installation would be restricted to the periphery of reef features to ensure continuous reef features are not bisected.

The Applicant submitted that even if localised areas of Annex I reef were disturbed during cable installation this would not preclude the recovery of reef should all other environmental conditions remain favourable for the presence of reef.

NE advised that the reef feature has a "restore" objective that would be hindered by the Proposed Development and the SNCBs do not agree with the Applicant's approach to the assessment of impacts [RR-097, REP1-212 and REP1-217].

The Applicant and the SNCBs do not agree on the appropriate methods and interpretation of reef features, particularly what qualifies as established reef as part of the wider feature. This was the subject of extensive debate during the Examination [REP1-217, REP3-076, REP3-077, REP1-222, REP1-131, REP2-004 and REP4-012].

The MMO also disagrees with the Applicant's approach [RR-085 and REP1-095]. The SNCBs have limited confidence that the reef feature would recover despite its ephemeral nature [REP1-214].

Given the concerns about the definition and mapping of the reef feature, the SNCBs query whether it would be possible to avoid it through the micrositing of the cables. They do not consider that routing the cables through areas of "lower quality reef" is acceptable as these areas should also be managed as part of the overall reef feature.

At Deadline 6 the Applicant suggested a change in response to concerns raised by NE relating to the feasibility of micrositing cables around reef features [REP6-038]. The effect of this would be to extend the cable corridor into the temporary working areas where it passes through the site, thus maximising the width of the cable corridor to give the greatest potential for micrositing [REP6-038].

NE points out that areas identified as having no reef may have been colonised and that any operation within areas defined by a geospatial reef layer should thus be avoided [REP7-065].

The ExA questioned the derivation of this layer during the course of the Examination through written questions [PD-008] and [PD-019]. In response, NE responded that a buffer should be applied to features where its extent may be uncertain or only mapped from point data and that "regulators should consider the margin as if it were part of the feature" [REP7-071].

The ExA considered that there was no evidence justify the 500 m buffer that has been applied to the reef features in the SAC and found it arbitrary. They went on to state that the degree to which the reef layer represents the potential extent of this highly mobile and ephemeral feature is equivocal and lacking any scientific justification.

The ExA stated that they were satisfied that the combination of pre-construction surveys with greater micrositing flexibility would mitigate the risk of adverse effects on this qualifying feature. This mitigation would be delivered through the Outline CSIP [REP7-021], as secured by Conditions 13(1)(h) of the generation assets deemed marine licence and 14(1)(h) of the transmission assets deemed marine licence which commit the Applicant to develop plans for site clearance and cable installation before commencing any works.

The Applicant did not consider any Annex I reef habitat likely to be affected by rock protection as they found no reefs in the SAC during the site specific surveys. The ExA agreed with this conclusion.

Given the above, the Secretary of State is in agreement with the ExA regarding the effectiveness of the Applicant's proposed mitigation to avoid impacts on reef features of the SAC. Therefore, the Secretary of State is satisfied that the potential for impacts on Annex I reef features as a result of the Project alone

would not represent an adverse effect upon the integrity of the North Norfolk Sandbanks and Saturn Reef SAC.

5.6.2 Annex I Reef: In Combination Assessment

As the Applicant found no Annex I reef within the cable corridor in the site surveys and considered that impacts on reef can be successfully mitigated through siting of the offshore export cable within the cable corridor, they considered there to be no adverse effect on the integrity of reef features either alone or in combination.

As noted above in the alone assessment, the Secretary of State, in agreement with the recommendations of the ExA, agreed with the Applicant that Annex I reef features can be successfully avoided.

Therefore, as per the alone assessment, the Secretary of State is satisfied that the potential for impacts on Annex I reef features as a result of the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the North Norfolk Sandbanks and Saturn Reef SAC.

5.6.3 Annex I Sandbanks which are slightly covered by sea water all of the time: Alone Assessment

The Secretary of State identified LSE for Annex I Sandbanks which are slightly covered by sea water all of the time. As approximately two thirds of the offshore cable corridor overlaps with the SAC, potential impacts on this feature could arise from the levelling and clearance of sandwaves during cable installation, and the dumping of rocks for cable protection.

5.6.3.1 Export Cable Installation

Table 10 presents the Project elements relating to the installation of the export cable which could impact the Annex I habitat ‘Sandbanks which are slightly covered by seawater all the time’ within the SAC. The area predicted to be impacted is up to approximately 9.3km^2, which comprise approximately 0.26% of the SAC (the entire SAC is designated and viewed as an Annex I sandbank sandbank system; JNCC, 2017[71]).

[71] http://archive.jncc.gov.uk/pdf/NNSSR_Conservation_Objectives_v1_0.pdf

Table 10: Project elements which will impact the Annex I 'Sandbanks which are slightly covered by seawater all of the time' within the North Norfolk Sandbanks and Saturn Reef SAC.

Project Element	Temporary habitat loss/disturbance (m^2) of Sandbanks which are slightly covered by seawater all the time	Assumptions
Pre-construction sandwave clearance	2,880,000 m^2	Clearance of sandwaves along up to 192 km of the offshore export cable, with up to six cables, each of up to 32 km length within the North Norfolk Sandbanks and Saturn Reef SAC. Sandwave clearance will affect a corridor of up to 30 m width of seabed (i.e. an additional 15 m width of disturbance on the 15 m associated with cable burial) (192,000 m x 15 m = 2,880,000 m^2).
Pre-construction sandwave clearance disposal activities	1,239,400 m^2	Up to 1,239,400 m^2 from placement of coarse, dredged material to a uniform thickness of 0.5 m because of sandwave clearance on the offshore cable corridor, assuming a volume of up to 619,700 m^3 of sandwave clearance material.
Pre-construction boulder clearance	900,000 m^2	Clearance of boulders along up to 90 km of cable, with up to six cables, each of up to 15 km length within the North Norfolk Sandbanks and Saturn Reef SAC. Boulder clearance will affect a corridor of up to 25 m width of seabed (i.e. an additional 10 m width of disturbance on the 15 m associated with cable burial) (90,000 m x 10 m = 900,000 m^2).
Cable burial	4,230,000 m^2	Burial of up to a total of 282 km cable length, with up to six cables, each of 47 km length within the North Norfolk Sandbanks and Saturn Reef SAC. Cable installation will affect a corridor of up to 15 m width of seabed (282,000 m x 15 m = 4,230,000 m^2).
Anchor placements	56,400 m^2	Up to one anchor (footprint of 100 m2 each) repositioned every 500 m of the 282 km cable length within the North Norfolk Sandbanks and Saturn Reef SAC, with up to six export cables (282,000 m x 100 m2 x 6 / 500 m = 56,400 m^2).
Total	9,305,800 m^2	

The Preliminary Trenching Assessment [REP5-010 and REP6-026] shows sections of the cable corridor comprise relatively large mobile sandwaves with a thickness of up to 6 m in places, but also that a significant proportion of the route within the SAC is characterised by a shallower sandwave depth.

The Applicant considers that effects on sandwave features to be temporary because the feature would recover post cable burial.

The Applicant highlighted the fact that the export cable route from the Race Bank Offshore Wind Farm passes through similarly dynamic areas of seabed, characterised by highly mobile sediments with migrating bedform features [APP-061].

Monitoring undertaken at Race Bank showed that after five months either partial or full recovery had occurred at ten out of 12 monitoring locations comprising 14 out of 19 sandwaves [REP1-183]. A further bathymetric monitoring report, including data from 2018, concluded that the seabed had either completely recovered or was close to recovering to pre-construction levels along most of the 9 monitoring locations that were selected [REP2-020].

NE agreed with the Applicant that the monitoring document provided some confidence that sandwaves would recover but questioned how analogous the Race Bank example was to the Project [REP3-076]. In particular, whether the same conclusions apply within the North Norfolk Sandbanks and Saturn Reef SAC. The ExA note that the depth of the Project area is comparable to Race Bank. Consequently, the rate of local sediment transport processes would be similar given the wave action exposure and high mobility of the impacted sediment.

However, the ExA go on to caution that whilst the dynamic environment may be similar, it is unclear whether there would be sufficient sediment available to ensure recovery of the shallower sandwave features along this section of the export cable route given the proximity of different sediments to the surface of the seabed (Figure 4.3 [REP5-010 and REP6-026]).

The Applicant also considers that the sediment type is likely to be uniform throughout the depth of the sandwave and any difference in dredged sediment type being added to a sandbank system would be rapidly incorporated into the seabed and redistributed as part of a dynamic environment.

Regarding recoverability of the sandwaves post clearance, NE and the MMO consider that as Race Bank sandwave clearance activities have only been undertaken relatively recently this limits the evidence for how quickly affected areas recover [REP7-066]. NE advised that whilst the extent of the potential impact is unclear, the extent of sandwave levelling is such that this cannot be considered *de minimus*.

The ExA submit that they consider that the available evidence suggests that recovery starts to occur soon after clearance in most instances provided sufficient substrate remains after levelling. Particularly, the ExA state that there is reasonable scientific doubt that smaller sandwaves may not recover where underlying sediments are exposed through a combination of post levelling erosion and the excavation of divergent substrata.

The Secretary of State is aware that results from monitoring undertaken by other projects, at other locations does not guarantee that identical results would occur elsewhere for similar activities in similar habitats; no two sites are identical. One of the aims of monitoring is to provide information to help inform future decisions and although not perfect should be considered in the absence of any data to the contrary. Any decision made is to be done so on the best available scientific evidence and not absolute certainty and without the use of existing monitoring data informed decisions cannot be made.

The Secretary of State agrees with the ExA in so far that the available evidence supports the assertion that sandwaves will start to recover shortly after cable laying has been completed; although the rate of recovery will vary. The Secretary of State recognises that there is uncertainty over the extent of the residual impact arising from the laying of cables, including whether some smaller sandwaves may fully recover in the event that there is not enough material for them to do so. However, the maximum area impacted by cable laying is 0.26% of the SAC and, based on the best available scientific evidence the majority, if not all, of which is predicted to recover. Consequently, the Secretary of State is satisfied that the potential for impacts on Annex I sandbank features from cable installation as a result of the Project alone would not represent an adverse effect upon the integrity of the North Norfolk Sandbanks and Saturn Reef SAC.

5.6.3.2 Rock cable protection

Cable protection is used in areas where the offshore export cable cannot be buried (due to unsuitable benthic conditions) and where the export cable crosses other cables and pipelines.

During Examination the total predicted area of habitat loss was approximately 0.5 km^2 from an assumed worst case scenario of rock protection being required for up to 10% of the export cable within the SAC and up to 20 pipeline/cable crossings. The associated increase in biodiversity from rock protection were predicted by the Applicant to affect up to 0.01% of the SAC (the entire SAC is designated and viewed as an Annex I sandbank sandbank system; JNCC, 2017[72]).

NE did not agree with the Applicant that 10% of the export cable within the SAC requiring protection was a realistic worst case scenario. However, the ExA did not agree with this assessment and cited previously constructed offshore windfarms at which a maximum of 6.3% of the cable length have required protection. The MMO also considered 10% of the cable requiring protection to be a reasonable worst case [REP3-092].

Subsequent to Examination and following a request by the Secretary of State[73], the Applicant has revisited the assessment on rock protection and subsequently revised the maximum proportion of cable that may require rock protection within the SAC from 10% to 6% which reduces the area of impact from 494,400 m^2 to 418,404 m^2; a reduction in the area impacted of 15.4% (Ørsted 2020)[74].

The Applicant did note that some naturally occurring hard substrate was identified and that in a habitat where encrusting epifaunal species are rare, the addition of additional hard substrate is likely to represent highly localised shifts in the baseline conditions.

The Applicant concluded that while there is the possibility of introduced rock substrate promoting the spread of non-indigenous species which could impact the diversity and structure of faunal communities, there has been no indication of this occurring in other developments elsewhere in British waters.

The Applicant considers that introduced Rock substrate does have the potential to impact the structure of the sandwaves in the SAC by posing an obstacle to sediment transport, trapping sediment and impacting sandwave formation down-drift by reducing the sediment supply.

The Applicant considers that at worst, the obstacle presented by the cable protection will locally prevent the onward passage of all sediment in transport, causing that sediment to accumulate locally and as accumulated sediment volume increases a sediment slope would develop on the updrift side. As the stable slope approaches the top of the rock protection (up to 2 m above the seabed), the blockage effect of the cable protection would be reduced and sediment would be transported directly over the obstacle unimpeded (ES volume 1, chapter 11).

The Applicant acknowledges that the North Norfolk Sandbanks are considered to have high sensitivity to physical loss via obstruction caused by the presence of structures. But it argues that the majority of the sandbanks are dynamic and mobile and therefore would have moderate levels of recoverability enabling them to return to a state close to that which existed before any impact.

The Applicant's conclusion is that as cable protection is likely to be in relatively discrete locations along the cable corridor (rather than continuous along the entire length), the impacts on sandbanks would be highly localised making impacts negligible [REP10-045].

The ExA accept that some recovery of some ecological function of the site would occur over time following the placing of rock cable but do not consider this to be an appropriate substitute for the loss of a

[72] http://archive.jncc.gov.uk/pdf/NNSSR_Conservation_Objectives_v1_0.pdf

[73] BEIS (2019). Planning Act 2008 – *Hornsea Project Three offshore wind farm – Request for extension of consultation.*

[74] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020.

designated feature nor does it represent adequate mitigation for this loss because the introduced rock would have fundamentally different physical and ecological characteristics to the sandwave features.

The decommissioning of rock protection also has the potential to impact the benthic ecology in the SAC. The effectiveness of decommissioning of rock cable protection is still largely unknown[75]. Therefore, the decision to either remove rock protection at the end of the Project's life or to leave *in-situ* will be decided closer to decommissioning.

The ExA state that they cannot rule out, beyond reasonable scientific doubt, the permanent loss of part of the Annex I sandwave feature either through the rock protection remaining *in situ* or its decommissioning where the underlying sediment would be removed, exposing a different substrate.

The ExA also point out that there is little evidence to suggest that the same biological communities would re-establish when the surface layers are removed during decommissioning, after having been covered with rock for an extended period of time.

Given the above, the ExA conclude that the rock protection would lead to a permanent change in the distribution and extent of the subtidal sand feature to the detriment of its physical structure and associated biological communities. They acknowledge that this would only affect a relatively small area of habitat but nevertheless find that the effect would not be negligible owing to its permanent nature and the potential for small, but nonetheless cumulative, effects.

The Secretary of State has considered the representations made by the Applicant, NE and the MMO and the recommendations made by the ExA.

The Secretary of State is conscious of previous decisions taken on wind farm applications and the reasoning behind them, where impacts on sandbank habitats within a SAC (The Dogger Bank SAC) from very similar activities as those being assessed here have been subject to HRAs (DECC 2015a, b) [76] [77]. Although it is recognised that previous impacts and assessments relate to a different designated Site, the Annex I habitat of concern, namely '*sandbanks which are slightly covered by seawater all the time*' is the same as that being considered here (although there are differences in the type of sandbank habitat). Furthermore, the conservation objectives and the condition of the site being 'unfavourable' and the need to restore the feature to a favourable condition are identical to those of the North Norfolk Sandbanks and Saturn Reef SAC.

The decisions were made on the basis that following the removal of the wind farm(s) and their associated deposits at the time of decommissioning the habitat would recover with recovery of ecology occurring

[75] JNCC (2017). *Identifying the possible impacts of rock dump from oil and gas decommissioning on Annex I mobile sandbanks*. JNCC Report 603.

[76] DECC (2015a). Record of the Habitats Regulations Assessment undertaken under regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) and regulation 25 of the Offshore Habitats Regulations for an Application under the Planning Act 2008 (As Amended**).** Dogger Bank Teesside A and B Offshore Wind Farm. 4 August 2015.

[77] DECC (2015b). *Record of the Habitats Regulations Assessment undertaken under regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) and regulation 25 of the Offshore Habitats Regulations for an Application under the Planning Act 2008 (As Amended**).** Dogger Bank Creyke Beck Offshore Wind Farm.* 17 February 2015.

within months/few years after decommissioning [78] [79]. At the time of Examination the level of evidence to support the conclusion that the site would recover following the removal of the impact was lower, with additional evidence now available from studies undertaken on Race Bank showing that the majority, if not all, of sandbank features will recover following the cessation of activities.

The Secretary of State is not aware of any substantive evidence as to why the complete removal of all infrastructure above or protruding from the seabed at the time of decommissioning within the North Norfolk Sandbanks and Saturn Reef SAC would not have the same beneficial effects as those from similar type of impacts predicted to occur within the Dogger Bank SAC.

On the basis that at the time of decommissioning, the Project will undertake the complete removal of all Project related infrastructure and associated deposits that are above or protruding from the seabed within the SAC and therefore impacts will be long-term but temporary and the site will recover over time, the Secretary of State is satisfied that the potential for impacts on Annex I sandbank features as a result of the Project alone would not represent an adverse effect upon the integrity of the North Norfolk Sandbanks and Saturn Reef SAC. The requirement for removal of infrastructure and associated deposits will be secured both within the DCO and the subsequent decommissioning programme that is required under The Energy Act 2004.

5.6.4 Annex I Sandbanks which are slightly covered by sea water all of the time: In combination Assessment

5.6.4.1 Sandwave clearance

When assessing cumulative habitat loss within the SAC, the Applicant considers that there is the potential for habitat loss as a result of construction activities associated with the Project in combination with oil and gas decommissioning activities and aggregate extraction activities identified in Table 11.

As with other in combination assessments, the Applicant took a tiered approach to considering plans or projects in combination with Hornsea Three. Only those projects that are located within the site boundary were considered relevant for this impact. These include:

- Tier 1 projects:
  - Oil and Gas decommissioning associated with VDP1, LDP and the Leman field; and
  - Licenced aggregate extraction areas: Area 484.
- Tier 2 projects:
  - Aggregation and extraction Application Area 483.

[78] The Planning Inspectorate (2014). *The Planning Act 2008 Dogger Bank Creyke Beck Offshore Wind Farm Examining Authority's report of findings and conclusions and recommendation to the Secretary of State for Energy and Climate Change*. 17 November 2014.

[79] The Planning Inspectorate (2015). *The Planning Act 2008 (as amended) Dogger Bank Teesside A and B Offshore Wind Farms Examining Authority's report of findings and conclusions and recommendation to the Secretary of State for Energy and Climate Change*. 5 May 2015.

Table 11: Predicted area of temporary habitat impacted for Hornsea Three and other plans/projects/activities within the North Norfolk Sandbanks and Saturn Reef SAC screened in for in combination assessment.

Project	Total predicted habitat impacted within the NNSSR SAC (km^2)	Source
Hornsea Three	9.31	RIAA alone assessment
Tier 1		
VDP1 (Viking CD, DD, ED, GD and HD platforms) / LDP1 (Vampire VO/Valkyrie, Viscount VO and Vulcan VR platforms)	17.28	Value taken from the Habitats Regulations Assessment[80] undertaken for the VDP1 and the LDP1. NOTE: All pipelines to remain in situ.
Audrey A and B platforms and associated pipelines	11.68	Values taken from Centrica[81]
Leman BH	Not quantified	Values for predicted temporary habitat loss are not presented in the Decommissioning Programme for this project (Shell UK Ltd[82]).
Aggregate area 484	1.38	8% of total licenced areas
Total Tier 1	39.64	
Tier 2		
Aggregate area 483	2.26	8% of total licenced areas
Total Tier 1 & 2	41.91	

5.6.4.2 Rock cable protection

For in combination impacts from rock protection with other plans or projects the Applicant considered that only the Tier 1 Oil and Gas decommissioning projects (VDP1 and LDP1) and the Audrey platforms and pipelines are located within the boundary of the North Norfolk Sandbanks and Saturn Reef SAC and so have the potential to result in habitat loss with Hornsea Three (see Table 12).

[80] Department of Energy and Climate Change (DECC) (2011) *Offshore Energy Strategic Environmental Assessment: Environmental Statement OEA2 Environmental Report - Future Leasing/Licensing for Offshore Renewable Energy, Offshore Oil and Gas, Hydrocarbon Gas and Carbon Dioxide Storage and Associated Infrastructure*. Department for Energy and Climate Change. URN 10D/1024.

[81] Centrica (2017) *A-Fields Decommissioning Saturn (Annabel) and Audrey Fields Environmental Impact Assessment*. Document ID: CEU-DCM-SNS0096-REP-0009. September 2017.

[82] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/611598/LBT-SH-AA-7180-00001-001_-_Leman_BH_DP_Rev_10.pdf

Table 12: Predicted permanent habitat loss for Hornsea Three in combination with plans/projects/activities within the North Norfolk Sandbanks and Saturn Reef SAC.

Project	Total Predicted Habitat Loss (km^2)	Source
Oil and Gas Decommissioning		
VDP1 (Viking CD, DD, ED, GD and HD platforms) / LDP1 (Vampire VO/Valkyrie, Viscount VO and Vulcan VR platforms)	0.049	Value taken from the Habitats Regulations Assessment undertaken for the VDP1 and the LDP1 (BEIS, 2017). All pipelines will remain in situ post decommissioning, but are buried so do not represent long term/permanent habitat loss
Audrey A and B platforms and associated pipelines	0.081	Values from Centrica[83]
Total	0.13	

The Secretary of State has considered representations made by the Applicant, NE and the MMO and the recommendations of the ExA. On the basis that there will be complete removal of all infrastructure and deposits and associated with the Project there will be no in-combination impact with other plans or projects and consequently no adverse effect on the integrity of the Annex I 'sandbanks slightly covered by water at all times' feature of the North Norfolk Sandbanks and Saturn Reef SAC from the Project in combination with other plans and projects.

5.7 Appropriate Assessment: The Wash and North Norfolk Coast SAC

The Wash and North Norfolk Coast SAC was designated in June 2005 and covers an area of approximately 1,078 km^2. It comprises a range of coastal, intertidal and marine habitats extending along the Lincolnshire and Norfolk coastlines. It has extensive areas of varying, but predominantly sandy, sediments subject to a range of conditions.

The following features from this site were screened into the AA:

- Sandbanks which are slightly covered by sea water all of the time
- Reef
- Harbour seal Phoca vitulina
- Otter *Lutra lutra*

The conservation objectives (Table 13) for the site were released by the NE[84] in November 2018.

[83] Centrica (2017) *A-Fields Decommissioning Saturn (Annabel) and Audrey Fields Environmental Impact Assessment.* Document ID: CEU-DCM-SNS0096-REP-0009. September 2017.

[84] http://publications.naturalengland.org.uk/file/5213489320951808

Table 13: Conservation objectives for the Wash and North Norfolk Coast SAC.

Conservation Objectives	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

The sandbank features within the site have been identified as being 72% in favourable condition and 28% in unfavourable, with the sub-features of subtidal coarse sediments and subtidal mixed sediments being in unfavourable condition. A total of 98% of the reef habitats are considered to be in either unfavourable or unfavourable but recovering condition [85].

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect is likely.

5.7.1 Annex I Reef: Alone and In combination Assessment

The Secretary of State identified a potential LSE for Annex I biogenic reef features of the SAC comprising the polychaete worm *sabellaria spinulosa*.

The Applicant submits that although the offshore cable corridor coincides with the JNCC delineated boundary of *Sabellaria spinulosa* reef in the Wash and North Norfolk Coast SAC, no Annex I reefs were identified during the site specific surveys of the offshore cable corridor coinciding with the Wash and North Norfolk Coast SAC.

The effects on the Annex I reef features were discussed at length in Section 5.6 (North Norfolk Coast SAC) of this AA and remain the same for the Wash and North Norfolk Coast SAC and therefore not repeated here.

The ExA stated that they were satisfied that the combination of pre-construction surveys with greater micrositing flexibility would mitigate the risk of adverse effects on this qualifying feature. This mitigation would be delivered through the Outline CSIP [REP7-021], as secured by Conditions 13(1)(h) of the generation assets deemed marine licence and 14(1)(h) of the transmission assets deemed marine licence which commit the Applicant to develop plans for site clearance and cable installation before commencing any works.

Given the above, the Secretary of State is in agreement with ExA regarding the effectiveness of the Applicant's proposed mitigation to avoid impacts on reef features of the SAC. Therefore, the Secretary of State is satisfied that the potential for impacts on Annex I reef features as a result of the Project alone

[85] Natural England (2019). https://designatedsites.naturalengland.org.uk/Marine/MarineFeatureCondition.aspx?SiteCode=UK0017075&SiteName=&SiteNameDisplay=The+Wash+and+North+Norfolk+Coast+SAC&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=

and in combination with other plans or projects would not represent an adverse effect upon the integrity of the Wash and North Norfolk Coast SAC.

5.7.2 Annex I Sandbanks which are slightly covered by sea water all of the time: Alone and In combination Assessment

The Secretary of State identified the Project as potentially having an LSE on the Annex I 'sandbanks which are slightly covered by sea water all of the time' alone and in combination.

5.7.2.1 Export Cable Installation

The SAC overlaps with the export cable corridor. The Applicant states that sandwave clearance associated with the installation of the export cable would affect a corridor of up to 30 m in width within the site and that this would amount to an area of just under 1 km^2 [APP-062].

The Applicant considered that due to the scale and localisation of sandwave clearance it would not lead to an adverse change to the Annex I features of the SAC.

The effects of sandwave clearance on the Annex I features of this SAC were discussed at length in Section 5.6 (North Norfolk Sandbanks and Saturn Reef SAC) of this AA. The Secretary of State considers the sandwave clearance issues discussed previously to be the same for this SAC. Consequently, they will not be repeated in this section.

The ExA recommend some of the affected area would recover but are not confident that all of it would. The ExA view is that there is reasonable scientific doubt that smaller sandwaves within the SAC may not recover where underlying sediments are exposed through a combination of post levelling erosion and the excavation of divergent substrata.

As with the North Norfolk Sandbanks and Saturn Reef SAC the Secretary of State agrees with the ExA in so far that the available evidence supports the assertion that sandwaves will start to recover after cable laying has been completed. He further recognises that there is uncertainty over whether smaller sandwaves may fully recover if there is insufficient sediment for them to do so. The Secretary of State recognises that there is uncertainty over the extent of the residual impact arising from the laying of cables. However, the maximum area impacted by cable laying is 0.20% of the SAC and, based on the best available scientific evidence, the majority, if not all, of which is predicted to recover. Consequently, the Secretary of State is satisfied that the potential for impacts on Annex I sandbank features from cable installation as a result of the Project alone would not represent an adverse effect upon the integrity of the Wash and North Norfolk Coast SAC.

5.7.2.2 Rock cable protection

At the time of application and during Examination the total predicted habitat loss for the Project as a result of cable protection, up to 46,200 m^2 of this is predicted to occur within the SAC. This represents 0.004% of the total area of the site. This area was calculated by assuming up to 10% of the 66 km of export cables within The Wash and North Norfolk Coast SAC (six cables of up to 11 km in length), and up to 7 m width of cable protection per cable (11,000 m x 6 x 0.1 x 7 m = 46,200 m^2) would require rock cable protection. Subsequent to Examination and following a request by the Secretary of State, the Applicant has revisited the assessment on rock protection required within the SAC and revised the maximum proportion of cable that may require rock protection within the SAC from 10% to 6% which reduces the area of impact from 46,200 m^2 to 27,720 m^2; a reduction in the area impacted of 40% and an impact across the site of 0.002% (Ørsted 2020)[86].

[86] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020

As with the assessment of sandwave clearance (above) the effects of the installation of rock cable protection on the Annex I features of this SAC were discussed at length in Section 5.6 (North Norfolk Sandbanks and Saturn Reef SAC) of this AA.

The ExA state that they cannot rule out, beyond reasonable scientific doubt, the permanent loss of part of the Annex I sandwave feature either through the rock protection remaining *in situ* or its decommissioning where the underlying sediment would be removed, exposing a different substrate.

The ExA also point out that there is little evidence to suggest that the same biological communities would re-establish when the surface layers are removed during decommissioning, after having been covered with rock for an extended period of time.

Given the above, the ExA conclude that the rock protection would lead to a permanent change in the distribution and extent of the subtidal sand feature to the detriment of its physical structure and associated biological communities. They acknowledge that this is would only affect a relatively small area of habitat but nevertheless find that the effect would not be negligible owing to its permanent nature and the potential for small, but nonetheless cumulative, effects.

The Secretary of State has considered the representations made by the Applicant, NE and the MMO and the recommendations made by the ExA.

As discussed in Section 5.6.3 the Secretary of State is conscious of previous decisions and the reasoning behind them taken on wind farm applications where impacts on sandbank habitats within a SAC have been subject to HRA. (The Dogger Bank SAC) from very similar activities as those being assessed here have been subject to HRAs (DECC 2015a, b)[87] [88]. Although it is recognised that previous impacts and assessments were for a different designated Site, the Annex I habitat of concern, namely '*sandbanks which are slightly covered by seawater all the time*' is the same as that being considered here (although there are differences in the type of sandbank habitat). Furthermore, the conservation objectives and the condition of the site being 'unfavourable' and the need to restore the feature to a favourable condition are identical to those of the North Norfolk Sandbanks and Saturn Reef SAC.

The decisions were made on the basis that following the removal of the wind farm(s) and their associated deposits at the time of decommissioning the habitat would recover with recovery of ecology occurring within months/few years after decommissioning [89] [90]. At the time of Examination the level of evidence to support the conclusion that the site would recover following the removal of the impact was lower, with additional evidence now available from studies undertaken on Race Bank showing that the majority, if not all, of sandbank features will recover following the cessation of activities.

[87] DECC (2015a). *Record of the Habitats Regulations Assessment undertaken under regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) and regulation 25 of the Offshore Habitats Regulations for an Application under the Planning Act 2008 (As Amended**).** Dogger Bank Teesside A and B Offshore Wind Farm*. 4 August 2015.

[88] DECC (2015b). *Record of the Habitats Regulations Assessment undertaken under regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) and regulation 25 of the Offshore Habitats Regulations for an Application under the Planning Act 2008 (As Amended**).** Dogger Bank Creyke Beck Offshore Wind Farm*. 17 February 2015

[89] The Planning Inspectorate (2014). *The Planning Act 2008 Dogger Bank Creyke Beck Offshore Wind Farm Examining Authority's report of findings and conclusions and recommendation to the Secretary of State for Energy and Climate Change*. 17 November 2014.

[90] The Planning Inspectorate (2015). *The Planning Act 2008 (as amended) Dogger Bank Teesside A and B Offshore Wind Farms Examining Authority's report of findings and conclusions and recommendation to the Secretary of State for Energy and Climate Change*. 5 May 2015.

The Secretary of State is not aware of any substantive evidence as to why the complete removal of all infrastructure at the time of decommissioning within the Wash and North Norfolk Coast SAC will not have the same beneficial effects as those from the very similar impacts predicted to occur within the Dogger Bank SAC.

On the basis that at the time of decommissioning, the Project will undertake the complete removal of all Project related infrastructure and associated deposits that are above or protruding from the seabed within the SAC and therefore impacts will be long-term but temporary and the site will recover over time, the Secretary of State is satisfied that the potential for impacts on Annex I sandbank features as a result of the Project alone would not represent an adverse effect upon the integrity of the Wash and North Norfolk Coast SAC. The requirement for removal of infrastructure and associated deposits will be secured both within the DCO and the subsequent decommissioning programme that is required under The Energy Act 2004.

5.7.3 Harbour Seal and Otter: Alone and In combination Assessment

The Secretary of State identified a potential LSE for Annex II features of the SAC comprising harbour seal *Phoca vitulina* and common otter *Lutra lutra*.

In the RIAA the Applicant assessed the potential impacts from construction/decommissioning and operational phases of the Project on harbour seal and otters.

5.7.3.1 Harbour seal

Potential impacts on harbour seal were identified as being underwater noise from pile driving and UXO clearance, changes in prey availability, increased vessel movements and pollution accidents.

The Wash and North Norfolk Coast support the largest colony of harbour seal in the UK (7% of the total UK population).

The Applicant undertook underwater noise modelling to predict auditory injury and disturbance of harbour seals, along with assessments of the potential effects from changes in prey availability, increased vessel movement and pollution accident. For each of these potential effects the applicant concluded no adverse effect on the Wash and North Norfolk Coast SAC from the Project alone or in combination with other plans or projects.

NE agreed with the Applicant's assessment and had no further comment in section 5.1.8(g) of their written representation [REP1-213].

Similarly, the ExA did not consider impacts on the harbour seal features of the SAC as requiring further discussion.

Therefore, the Secretary of State is content that there would not be an adverse effect on the integrity of the harbour seal features of the Wash and North Norfolk Coast SAC from the Project alone or in combination with other plans or projects.

5.7.3.2 Otter

Potential impacts on otter were identified as permanent habitat loss from the installation of the export cable.

Permanent habitat loss will occur where natural or semi-natural habitats are replaced with concrete and other manmade materials, i.e. at the location of the onshore HVAC booster station, the onshore HVDC converter/HVAC substation and link boxes. Design measures incorporated into the project include the use of HDD under main rivers, and where possible under other watercourses supporting otters. Where HDD is to be undertaken beneath watercourses supporting otter, the launch pits will be located a minimum distance from the known otter holts and other identified resting places.

The Applicant concluded that the proposed design and pre-construction measures will avoid permanent habitat loss in the SAC and in functionally linked land associated with the otters. Furthermore, the construction measures will effectively minimise habitat fragmentation. Therefore, no adverse effect on site integrity will occur with respect to the extent and distribution of the Annex II species and the extent, distribution, structure and function of their supporting habitats.

As with potential impacts on harbour seal (above) NE agreed with the Applicant's assessment and had no further comment in section 5.1.8(g) of their written representation [REP1-213].

The ExA did not consider impacts on the otter features of the SAC as requiring further discussion.

Therefore, the Secretary of State is content that there would not be an adverse effect on the integrity of the otter features of the Wash and North Norfolk Coast SAC from the Project alone or in combination with other plans or projects.

5.8 Appropriate Assessment: River Wensum SAC

The River Wensum is a naturally enriched, calcareous lowland river. The upper reaches are fed by springs that rise from the chalk and by run-off from calcareous soils rich in plant nutrients. This gives rise to beds of submerged and emergent vegetation characteristic of a chalk stream. Lower down, the chalk is overlain with boulder clay and river gravels, resulting in aquatic plant communities more typical of a slow-flowing river on mixed substrate. Much of the land adjacent to the river is managed for hay crops and by grazing, and the resulting mosaic of meadow and marsh habitats, provides niches for a wide variety of specialised plants and animals.

The site was designated in 2005 and covers an area of approximately 3.82 km^2. It was designated for floating aquatic vegetation that is dominated by water-crowfoot and a number of species that include white-clawed crayfish, bullhead, brook lamprey and Desmoulin's whorl snail.

The conservation objectives for the River Wensum SAC are shown in Table 14.

Table 14: Conservation objectives for the River Wensum SAC.

Conservation Objectives	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats and habitats of qualifying species • The structure and function (including typical species) of qualifying natural habitats • The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely • The populations of qualifying species, and, • The distribution of qualifying species within the site.

The Secretary of State has considered the potential for the Project to constitute an adverse effect on site integrity for each feature for which a significant effect is likely.

5.8.1 Annex I and Annex II features: Alone Assessment

The Secretary of State identified LSE for Annex I and Annex II features of the SAC comprising watercourses of plain to montane levels and species which they support including: Desmoulin's whorl snail, white-clawed crayfish, brook, lamprey and bullhead.

Both permanent and temporary impacts on the designated features could arise from the installation of the onshore export cable. Annex II species could be impacted if the supporting Annex I habitat (watercourses of plain to montane levels) was damaged from cable installation through physical or pollution impacts.

The Applicant considers that permanent habitat loss would occur where natural or semi-natural habitats are replaced with manmade materials, i.e. at the onshore HVAC booster station, HVDC converter/HVAC substation and link boxes.

The Applicant concludes that as the onshore cable corridor does not spatially overlap with areas of floating vegetation often dominated by water-crowfoot and that no likely hydrological effects were identified, no adverse effect on site integrity from permanent effects would occur.

In terms of temporary impacts, the Applicant considers that temporary disturbance/damage could occur where natural or semi-natural habitats are subjected to activities that result in the removal of vegetation; the breaking up of the soil structure; and compaction by trackway, vehicles, personnel, equipment and stored materials.

The Applicant proposes that permanent and temporary impacts will be avoided by the application of HDD under the River Wensum SAC.

NE raised concerns over the protection of watercourses in relation to HDD sediment lagoons and the soil storage areas [REP6-057]. Their concerns were over the location of HDD sediment lagoons and soil storage areas and whether adequate pollution control measures would be present.

In response to NE's concerns, the Applicant agreed that details of specific flood control measures relating to the onshore cable corridor would be submitted to Norfolk County Council for approval as the Lead Local Flood Authority when a contractor is appointed. These measures would include a specific requirement to consider storm events, regular removal of lagoon slurry by tankers, sufficient freeboard to accommodate extreme rainfall events and ongoing consultation with NE and the Environment Agency [REP1-122].

Additionally, the Applicant states that there would be no HDD exit pits and hence no settlement lagoons within 10 m of any watercourse or within any designated sites. The Applicant also committed to undertake site-specific hydrogeological risk assessments at sensitive crossing locations and further consultation with NE with regard to the site-specific crossing method statements at the River Wensum crossing to ensure that any adverse effects the River Wensum SAC are avoided [REP7-007].

Despite these undertakings and agreement with EA that the watercourse protection measures are adequate [REP1-203], the position of NE remained unchanged at end of the Examination [REP10-045].

The ExA concludes the hydrological protection measures would be adequate to protect the terrestrial and aquatic environments in the River Wensum SAC. The ExA note that these measures would be secured through Requirement 17 of the DCO (i.e. the Applicant must submit a detailed CoCP for approval by the relevant planning authority in consultation with the EA and the relevant statutory nature conservation body [REP10-041]).

The Secretary of State has considered the representations by the Applicant, NE and the Environment agency, along with the recommendations made by the ExA. The Secretary of State agrees with the ExA that the hydrological protection measures proposed by the Applicant are sufficient to mitigate any potential impacts on the Annex I and Annex II features of the River Wensum SAC.

Therefore, the Secretary of State is satisfied that the potential impacts on the Annex I and Annex II features of the River Wensum SAC from the Project alone would not represent an adverse effect upon the integrity of the River Wensum SAC.

5.8.2 Annex I and Annex II features: In Combination Assessment

In undertaking the assessment of impacts on the SAC from the Project in combination with other plans or projects, the Applicant only considered the onshore export cable and associated access infrastructure were near enough to the SAC for in combination impact pathways to exist.

No Tier 1 projects were identified by the Applicant as having a potential in combination impact on the SAC. Furthermore, all Tier 2 residential and commercial developments which could potentially have an in combination impact on the SAC are located downstream of the River Wensum SAC.

The Applicant notes that as the onshore cable corridor will employ HDD to pass under the River Wensum SAC, any sediment ingress from the Project will be avoided during construction and operation. The Applicant therefore concludes that an in combination impact pathway to the River Wensum is not reasonably foreseeable.

The ExA agrees with the conclusions of the Applicant that there would be no foreseeable in combination impact from the Project and other plans or projects.

As per the assessment of the Project alone, the Secretary of State is therefore satisfied that the potential impacts on the Annex I and Annex II features of the River Wensum SAC from the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the River Wensum SAC.

5.9 Appropriate Assessment: Southern North Sea SAC

The Southern North Sea SAC was designated on 26 February 2019 for harbour porpoise. The site is located to the east of England and stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south, covering an area of approximately 36,951 km^2. A mix of habitats, such as sandbanks and gravel beds, cover the seabed and water depths range from mean low water to 75 m. The majority of the site has water depths of less than 40 m.

The qualifying feature relevant to this AA is harbour porpoise (*Phocoena phocoena*).

The conservation objectives for the site were released by the JNCC in March 2019 (Table 15 below)[91].

Table 15: Conservation objectives for the Southern North Sea SAC.

Conservation Objectives	To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters In the context of natural change, this will be achieved by ensuring that: 1. Harbour porpoise is a viable component of the site; 2. There is no significant disturbance of the species; and 3. The condition of supporting habitats and processes, and the availability of prey is maintained.

An LSE upon the harbour porpoise interest feature of the SAC was identified because of the potential for the Project alone and in-combination with other plans or projects to impact the harbour porpoise feature of the site from:

[91] http://archive.jncc.gov.uk/pdf/SNorthSea_ConsAdvice.pdf

- underwater noise from foundation installation and UXO clearance (pre-construction/construction),
- increased vessel traffic and collision risk (Construction/Decommissioning/Operation) and
- accidental pollution events (Construction/Decommissioning/ Operation).

The Secretary of State considers each of these potential impacts below.

5.9.1 Harbour Porpoise: Alone Assessment

5.9.1.1 Underwater noise from foundation installation and UXO clearance

The primary source of subsea noise before and during construction is from the installation of the foundations for the turbines, offshore substations and accommodation platforms within the Project area.

The Applicant undertook noise modelling in order to assess the risk of injury, including auditory injury (Permanent Threshold Shift (PTS)) from pile-driving noise. For behavioural impacts on harbour porpoise in the Southern North Sea SAC the applicant followed current SNCB advice that states that a standardised precautionary distance of 26 km should be used for HRA purposes.

The Applicant considers that the noise impact range set out in the RIAA [APP-051], alongside a post consent Marine Mammal Mitigation Protocol (MMMP), would reduce the risk of Permanent Threshold Shift (PTS) for harbour porpoise to a negligible level. The Applicant maintains that there is no indication that the potential for lethality/ injury or hearing impairment effects associated with underwater noise from piling activities would lead to a reduction in the viability of the harbour porpoise interest feature.

NE agrees with this position and has advised that there would be no adverse effects on the integrity of the site from the project alone either in relation to PTS or displacement effects [RR-097 and REP1-213]. Furthermore, all matters relating to the assessment of marine mammal impacts and potential effects on the integrity of the site were agreed with NE with the exception of potential cumulative effects resulting from the disposal of unexploded ordinance (UXO) and simultaneous piling activity that could arise from other offshore projects [REP1-218].

The Whale and Dolphin Conservation (WDC) do not agree that following the current JNCC MMMP guidance would reduce PTS to negligible levels [REP1-022 and REP4-117]. NE has advised that the guidance is out of date and alternative approaches should be considered [REP1-212 and REP4-130]. However, it nevertheless agrees that the soft start procedure is an appropriate form of mitigation to reduce the risk of PTS [REP7-065]. The Applicant maintains that it is committed to developing a robust MMMP to ensure PTS effects are negligible and that this would be informed by the best guidance available at the time [REP1-122, REP2-004, REP5-008 and REP6-010].

WDC consider that the MMMP should include mitigation measures that are used in other European countries, such as bubble curtains [REP1-022].

The ExA note that the Applicant has not precluded using additional measures and that this is secured through Condition 13(1)(g) of the generation assets DML and Condition 14(1)(g) of the transmission assets DML which commit the undertaker to develop and secure approval of marine mammal mitigation in the event that pile driven foundations are constructed [REP10-041].

The Wildlife Trusts (TWT) accepted the Applicant's assessment of UXO clearance but remains concerned about potential PTS impacts [REP1-227].

However, as highlighted by the ExA, the Secretary of State notes that the Applicant is not seeking consent for UXO clearance works as part of this consent. A UXO marine licence would be necessary from the MMO with a separate UXO MMMP in place prior to commencement of any clearance works. This would be agreed with the MMO and statutory consultees and the Secretary of State is satisfied that this would control any adverse effects alone or in combination with other projects.

The final position at Deadline 9 between the Applicant and NE [REP9-022] is that whilst all noise impacts should have been assessed together, this matter can nevertheless be addressed through the proposed Site Integrity Plan (SIP) [REP4-066]. There are no outstanding areas of disagreement with the MMO with regard to the assessment of marine mammal impacts [REP9-023].

NE advocates the use of the SIP but does not agree that the versions submitted by the Applicant at Deadline 1 [REP1-181] and Deadline 4 [REP4-066] are adequate. Both NE and the MMO advise that the SIP should include explicit details of the mitigation measures proposed [REP4-130 and REP6-072]. TWT also highlight the fact that it lacks detail [REP1-023].

The MMO advise that agreement of the final SIP should take place at least 6 months prior to commencement of any activities likely to impact on the site unless otherwise agreed [REP6-072]. The MMO also advises that, as there is an increasing level of noise-generating activities within the site, additional mitigation measures and co-operation across the industry is likely to be required [REP6-073]. NE remains concerned about the lack of a mechanism to enable to consideration of multiple SIPs [REP4-130 and REP6-055].

The ExA note however, that NE [REP6-055], the MMO [REP6-073] and the Applicant [REP6-010] are all in agreement that the content of the Outline SIP is agreed [REP10-045] and is the appropriate control mechanism to manage any in combination risk and that concerns relating to strategic regulatory control mechanisms are beyond the scope of the Examination.

The Secretary of State notes that underwater noise regulators in the Southern North Sea are working closely to effectively regulate underwater noise and agrees with the ExA that although this collaboration is aimed at effectively managing underwater noise in the Southern North Sea SAC, the conclusions of this AA do not depend on the actions of the regulators group.

As per the reasoning above and in agreement with the recommendations of the ExA, the Secretary of State is content that underwater noise from the Project alone would not have an adverse effect on the Annex II harbour porpoise features of the Southern North Sea SAC.

5.9.1.2 Increased Vessel Traffic

Increased vessel movement has the potential to result in a range of impacts on harbour porpoise, including:

- Masking of vocalisations or changes in vocalisation rate;
- Avoidance behaviour or displacement; and
- Injury or death due to collision with vessels.

The Applicant's assessment of the impacts of increased vessel movement from the project alone considers that there is a high likelihood of avoidance (from harbour porpoise) from both increased vessel noise and collision risk, with both a high potential for recovery (< 1 year) for increased noise, and medium potential for recovery for collision risk (reflecting the low likelihood of collision and potential for non-lethal collision to occur).

While the recovery from vessel disturbance is dependent on the number of vessels present during the operational phase, operational phase vessels are likely to be smaller and consequently disturbance and collision risk are considered to be reduced. The Applicant also notes that during the second phase of construction, it is likely that vessels may undertake joint construction and operational activities while on site, reducing the combined vessel movements required.

Based on the above and considering the lack of objection to these conclusions from interested parties, the Secretary of State is content that increased project vessel traffic from the Project alone would not have an adverse effect on the Annex II harbour porpoise features of the Southern North Sea SAC.

5.9.1.3 Pollution

The potential sources of pollution during the construction phase include vessel movements, use of drilling muds and storage of chemicals including lubricants, coolant, hydraulic oil and fuel on offshore platforms. The magnitude of the impact is dependent on the nature of the pollution incident.

The Applicant cites the Strategic Environmental Assessment (SEA) carried out by DECC in 2011[92] which recognised that, "renewable energy developments have a generally limited potential for accidental loss of containment of hydrocarbons and chemicals, due to the relatively small inventories contained on the installations (principally hydraulic, gearbox and other lubricating oils, depending on the type of installation)".

The Applicant concludes that any spill or leak within the offshore regions of the Project area would be immediately diluted and rapidly dispersed and therefore that there is no indication that effects associated with accidental pollution events would lead to a reduction in the viability of the harbour porpoise feature.

Based on the above and considering the lack of objection to these conclusions from interested parties, the Secretary of State is content that increased risk of pollution from the Project alone would not have an adverse effect on the Annex II harbour porpoise features of the Southern North Sea SAC.

5.9.1.4 Conclusions

The Secretary of State recognises the methodological disagreements between TWT and NE and the Applicant. He has considered the representations made by the Applicant, NE, TWT and the WDC and the recommendation as made by the ExA. The Secretary of State notes that NE agree with the Applicant that effects from the project alone would not lead to an adverse effect on the SAC [RR-097 and REP1-213].

The Secretary of State is therefore satisfied that the potential impacts on harbour porpoise as a result of the Project alone would not represent an adverse effect upon the integrity of the Southern North Sea SAC.

5.9.2 Harbour Porpoise: In Combination Assessment

The projects considered in this in-combination assessment are those activities which have not been included in the baseline assessment for marine mammals, and where there was the potential for impacts to arise during the construction, operation and maintenance, or decommissioning phase of the Project. These projects include:

- Offshore energy developments;
- Cables and pipelines;
- Marine aggregates;
- Military and aviation; and
- Coastal developments (i.e. ports and harbours).

The Applicant considered there to be no additional effects likely to occur from oil and gas projects, shipping and navigation, and commercial fisheries as these activities are included as part of the baseline assessment on marine mammals (ES volume 4, annex 5.1: Cumulative Effects Screening Matrix).

[92] Department of Energy and Climate Change (DECC) (2011) Offshore Energy Strategic Environmental Assessment: Environmental StatementEA2 Environmental Report - Future Leasing/Licensing for Offshore Renewable Energy, Offshore Oil and Gas, Hydrocarbon Gas and Carbon Dioxide Storage and Associated Infrastructure. Department for Energy and Climate Change. URN 10D/1024.

TWT considers that fishing is a licensable activity that has the potential to have an adverse impact on the marine environment and that it must be included in all in combination assessments to meet the requirements of Article 6(3) of the Habitats Directive.

On the authority of C127/02 Waddenzee [2004] ECR I-7405 the ExA accept that fishing is a plan or project that should be subject to assessment each time an application for a licence is considered. From a technical point of view, each new fishing licence renewal is a new plan or project and they therefore accept that the potential for new fishing plans or projects should be considered in any in combination assessment.

The ExA's view is that, from a practical point of view, if the effects of the on-going activity have already been assessed in the baseline then it would not serve the purpose of the legislation to assess the effects of a continuing, existing activity for a second time unless there is evidence to suggest that a new licence is being applied that will seek to intensify or extend the fishing.

As the ExA had no such evidence presented at examination and no indication of future fishing activity they conclude that fishing activity should not have been included as an in combination effect and that the conclusions of the ES [APP-064] and RIAA [APP-051] therefore remain valid.

The Secretary of State shares the ExA's view (above) and considers that commercial fishing can be considered in the environmental baseline and should not be considered as an in combination effect.

The in combination assessment was undertaken in line with other in combination assessments in this AA whereby plans or projects which could have an effect were grouped into Tiers depending on the likelihood of them going ahead.

The Tiers were allocated as follows:

- Tier 1: The Project considered alongside other project/plans currently under construction and/or those with a legally secure consent (i.e. projects that are not subject to an ongoing judicial review process) that have been awarded a CFD but have not yet been implemented and/or those currently operational that were not operational when baseline data was collected, and/or those that are operational but have an on-going impact;
- Tier 2: All projects/plans considered in Tier 1, as well as those project/plans that have consent but have no CFD and/or submitted but not yet determined; and
- Tier 3: All projects/plans considered in Tier 2, as well as those on relevant plans and programmes likely to come forward but have not yet submitted an application for consent (the PINS programme of projects and the adopted development plan including supplementary planning documents are the most relevant sources of information, along with information from the relevant planning authorities regarding planned major works being consulted upon, but not yet the subject of a consent application). Specifically, this Tier includes all projects where the developer has advised PINS in writing that they intend to submit an application in the future, those projects where a Scoping Report is available and/or those projects which have published a Preliminary Environmental Information Report (PEIR).

Accidental pollution was not considered at the in combination stage of this assessment due to the likely localised nature of the impact.

5.9.2.1 Underwater noise

The primary impulsive underwater noise impacts which were considered in combination with pile driving from the project construction were:

- pile driving at other offshore wind farms
- oil and gas seismic surveys; and
- UXO clearance prior to construction of other wind farms.

All projects screened in to the in combination assessment of underwater noise are set out in detail in Table 6.23 of the RIAA [APP-051].

Projects assessed for underwater noise impacts in combination with Hornsea Three were as follows:

- Tier 1
  - Hornsea Two (Sequential piling – summer; concurrent piling – summer)
  - Triton Knoll (Sequential piling – summer & winter; concurrent piling – summer & winter)
- Tier 2
  - Dogger Bank Creyke Beck A & B (Sequential piling – summer; concurrent piling – summer)
  - Dogger Bank Teeside Beck A & B (Sequential piling – summer; concurrent piling - summer)
  - East Anglia Three (Sequential piling – summer & winter; concurrent piling – summer & winter)
- Tier 3
  - Norfolk Vanguard (Sequential piling – summer & winter; concurrent piling – summer & winter)
  - Thanet extension (Sequential piling – winter; concurrent piling –winter)

TWT highlights a number of additional OWFs that should be included in the absence of a strategic approach that controls simultaneous impacts across multiple projects [REP1-023].

TWT and WDC disagree with the approach to cumulative underwater noise management advocated by the SNCBs [REP1-023 and REP4-119] and suggest that noise limits should be set which should not be exceeded during piling [REP1-017, REP1-023 and REP4-119].

The Applicant maintains that its assessment is adequate and in line with established SNCB guidance [REP2-004] and no effects on integrity are predicted. Whilst the SIP is intended to mitigate any potential in combination effects that could arise, it is not certain what other activities may occur during the construction period [REP5-008].

The Secretary of State acknowledges that the detail of the SIP cannot be finalised until the final project design is decided and the degree of temporal overlap with other projects is known. They also note that potential mitigation measures are listed in the SIP.

In light of uncertainty around the effectiveness of mitigation measures in the SIP to prevent an in combination impact on the SAC, the ExA state that they require a greater degree of certainty than the monitoring provisions included in Condition 18 of the generation assets DML allow. They state that there could be an unacceptable lag between the monitoring and the mitigation of underwater noise which could lead to adverse effects on the SAC.

The Secretary of State therefore agrees with the ExA and should a development consent order be made favours the alternative drafting for Condition 18 proposed by the MMO.

Condition 18(2) provides for construction monitoring, to include monitoring of underwater noise from piling. The MMO [REP5-029] (supported by NE) suggested an amendment to the effect that, if monitoring shows significantly different impacts to those assessed in the ES, piling activity should cease until an update to the marine mammal mitigation protocol and further monitoring requirements have been agreed.

The alternative wording is as follows:

The results of the initial noise measurements monitored in accordance with condition 18(2)(a) must be provided to the MMO within six weeks of the installation of the first four piled foundations of each piled

foundation type. The assessment of this report by the MMO will determine whether any further noise monitoring is required. If, in the opinion of the MMO in consultation with Natural England, the assessment shows significantly different impact to those assessed in the environmental statement or failures in mitigation, all piling activity must cease until an update to the MMMP and further monitoring requirements have been agreed.

The ExA included this alternative wording in their schedule of changes to the draft DCO [PD-017].

A number of additional concerns were raised by WDC and TWT with no agreement being reached by the end of the Examination [REP10-045]. These were broadly related to the baseline characterisation, disturbance impact and likely cumulative effects [REP1-022, REP1-023 and REP4-117].

Regarding disturbance effects, TWT disputes the use of Booth *et al*. (2017)[93] to determine the significance of cumulative underwater noise impacts on harbour porpoise because it relies upon expert opinion rather than empirical data [REP1-023]. However, the Applicant subsequently ran an updated version of the Interim Population Consequences of Disturbance model which incorporated all available empirical information on harbour porpoise energetics, diet and responses to piling noise and arrived at similar or lower magnitude effects to the ones reported [REP2-004].

The ExA are satisfied that a suitably robust range of information has been used and conclude that the associated conclusions of the ES [APP-064] and the RIAA [APP-051] remain valid, namely that there would be no long term population level impact on harbour porpoise arising from underwater noise disturbance.

As with the assessment of the Project alone, the Secretary of State notes that regulators are working closely to effectively regulate underwater noise and agrees with the ExA that although this collaboration is aimed at effectively managing the in combination impacts of underwater noise in the Southern North Sea SAC effectively, the conclusions of this AA do not depend on the actions of the regulators group.

As per the reasoning above and in agreement with the recommendations of the ExA, the Secretary of State is content that underwater noise from the Project in combination with other plans or projects would not have an adverse effect on the Annex II harbour porpoise features of the Southern North Sea SAC.

5.9.2.2 Increased Vessel Activity

A tiered approach was taken to assessing in combination impacts from vessel activity. Table 16 shows the Tier 1 projects and their predicted number of vessel movements which were included in the in combination assessment.

[93] Booth, C.G., Harwood, J., Plunkett, R, Mendes, S, & Walker, R. (2017). *Using the Interim PCoD framework to assess the potential impacts of offshore wind developments in Eastern English Waters on harbour porpoises in the North Sea* Natural England Joint Report, Number 024 York

Table 16: Tier 1 In-combination assessment of vessel movements

Project	Construction – Approximate Number of vessel movements (return trips)	Operation and Maintenance – Approximate Number of vessel movements (return trips)
Under construction offshore wind farms		
Dudgeon	Info not available	Info not available
Beatrice	1,350 (675 per year)	365 per year
Race Bank	2,730 per year	704 per year
Hornsea P 1	6,966 over construction period (three phases over five years)	2,630 per year
Blyth demonstrator	Info not available	Info not available
Galloper	Not Specified in ES	Not Specified in ES
Consented/submitted offshore wind farms		
Aberdeen Bay demonstrator	494 in total over 2 years	1,080 per year
Dogger Bank Creyke A & B	3,460 in total over 3 years	683 per year
Dogger Bank Teeside A & B	5,810 in total over 6 years	730 per year
East Anglia One	5,700 in total over 2.5 years	2,160 per year
East Anglia Three	8,000 over 3.75 years	4,067 per year
Hornsea P 2	6,200 over up to 7.5 years	2,817 per year
Kincardine	Minimal	Minimal
Triton Knoll	3,850 over 3 years	9,220 per year
Hywind Scotland Pilot Park	Minimal	Minimal
MORL Eastern Development Area	1,355 per construction period (4065 total)	Not available/assessed as not significant
Inch Cape	3,500 over 1.5 years	Not available
Neart na Goithe	9,792 over 17 month construction period	1,550 per year
Sea Green (7 sub projects)	4 vessels on site at any one time for each sub-project = 28 vessels in total at any one time over construction period	1,760 per year

Norfolk Vanguard and MORL western development area were assessed as Tier 2 developments.

In combination impacts are predicted to be of regional spatial extent, long term duration (lifetime of the project – 35 years), intermittent, and both reversible (disturbance due to increased vessel noise) and irreversible (collision risk). It is predicted that the impact will affect the feature both directly (collision risk) and indirectly (disturbance due to increased vessel movement).

The Applicant considers there to be no indication that in-combination effects associated with increased vessel traffic would lead to a reduction in the viability of the harbour porpoise feature and there is no indication that effects would result in a permanent shift in the distribution of the feature within the SAC in the long term. The Applicant also submits that this impact in-combination with other plans and projects would not adversely affect any other factors which are required to ensure that the site is maintained in favourable condition as defined in the Conservation Objectives of the SAC.

WDC highlights concerns over the disturbance impact from increased vessel activity at all stages of the Proposed Development because of its ability to interrupt harbour porpoise foraging behaviour and echolocation. Despite these concerns, by the end of the examination the WDC acknowledged that this impact was adequately assessed in the ES [REP4-117].

TWT advocated for the adoption of a strategic approach to cumulative impact assessment, but the ExA considered this to be outside the scope of the Examination [REP4-119].

Based on the above, and in line with the recommendation of the ExA, the Secretary of State is content that increased project vessel traffic from the Project in combination with other plans or projects would not have an adverse effect on the Annex II harbour porpoise features of the Southern North Sea SAC.

5.9.2.3 Conclusion

The Secretary of State recognises the methodological disagreements between TWT, WDC and NE and the Applicant. He has considered the representations made by the Applicant, NE, TWT and the WDC and the recommendation as made by the ExA. The Secretary of State notes that NE agree with the Applicant that effects from the project in combination with other plans or projects would not lead to an adverse effect on the SAC [RR-097 and REP1-213].

The Secretary of State is therefore satisfied that the potential impacts on harbour porpoise as a result of the Project in combination with other plans or projects would not represent an adverse effect upon the integrity of the Southern North Sea SAC.

6 Habitats Regulations Assessment Overall Conclusions

The Secretary of State has carefully considered all of the information presented before and during the Examination, including the RIES, the ES, representations made by Interested Parties, and the ExA's report itself. He considers that the Project has the potential to have an LSE on 14 European sites when considered alone and in-combination with other plans or projects. These sites are listed below:

- Coquet Island SPA
- Farne Islands SPA
- Forth Islands SPA
- Flamborough and Filey Coast SPA
- Greater Wash SPA
- North Norfolk Coast SPA/Ramsar site
- Berwickshire and North Northumberland Coast SAC
- Humber Estuary SAC and Ramsar site
- Norfolk Valley Fens SAC
- North Norfolk Coast SAC
- North Norfolk Sandbanks and Saturn Reef SAC
- River Wensum SAC
- The Southern North Sea SAC
- The Wash and North Norfolk Coast SAC

The Secretary of State has undertaken an AA in respect of those 14 European sites' Conservation Objectives to determine whether the Project, either alone or in-combination with other plans or projects, will result in an adverse effect on integrity.

The Secretary of State has undertaken a robust assessment using all of the information available to him, not least the advice from the SNCBs, the recommendations of the ExA and the views of Interested Parties including the Applicant. Having considered all of the information available and the mitigation measures secured through the DCO and dMLs, the Secretary of State has concluded that the Project will not have an adverse effect on integrity on the relevant qualifying features of the following sites:

- Berwickshire and North Northumberland Coast SAC
- Coquet Island SPA
- Farne Islands SPA
- Forth Islands SPA
- Flamborough and Filey Coast SPA
- Greater Wash SPA
- Humber Estuary SAC and Ramsar site
- Norfolk Valley Fens SAC
- North Norfolk Coast SAC
- North Norfolk Coast SPA/Ramsar site
- River Wensum SAC
- The Southern North Sea SAC

However, the Secretary of State cannot rule out an adverse effect on integrity beyond reasonable scientific doubt in relation to the in combination impacts on kittiwake, a qualifying feature of the Flamborough and Filey Coast SPA.

The Secretary of State concludes that the Project does not meet the integrity test and that the further tests set out in the Habitats Regulations must be applied. These include an assessment of alternatives, Imperative Reasons of Overriding Public Interest (IROPI) and environmental compensation.

Further consideration on whether sufficient information on the further tests set out in the Habitat Regulations to allow a decision to be made are presented in Section 10 through Section 14.

The mitigation for the Project referred to in this HRA will be secured and delivered through the DCO within dML Conditions:

- Condition 13(1)(b) in Schedule 11 – Condition 14(1)(b) in Schedule 12
- Condition 13(1)(c)(ix) in Schedule 11 – Condition 14(1)(c)(ix) in Schedule 12
- Condition 13(1)(d)(i-iii) in Schedule 11 – Condition 14(1)(d)(i-iii) in Schedule 12
- Condition 13(1)(e) in Schedule 11 – Condition 14(1)(e) in Schedule 12
- Condition 13(1)(f) in Schedule 11 – Condition 14(1)(f) in Schedule 12
- Condition 13(1)(g) in Schedule 11 – Condition 14(1)(g) in Schedule 12
- Condition 13(1)(h)(i-iii) in Schedule 11 – Condition 14(1)(h)(i-iii) in Schedule 12
- Condition 13(1)(k) in Schedule 11 – Condition 14(1)(k) in Schedule 12
- Condition 13(1)(l) in Schedule 11 – Condition 14(1)(l) in Schedule 12
- Condition 13(5) in Schedule 11 – Condition 14(5) in Schedule 12
- Condition 13(6) in Schedules 11 – Condition 14(6) in Schedule 12
- Condition 13(7) in Schedules 11 – Condition 14(7) in Schedule 12
- Condition 13(8) in Schedules 11 – Condition 14(8) in Schedule 12

7 Transboundary Assessment

Given the potential for this Project to affect mobile features across a wide geographical area; the Secretary of State believes it important to consider the potential impacts on European sites in other European Economic Area ("EEA") states, known as transboundary sites, in further detail. The ExA also considered the implications for these sites, in the context of looking at the wider EIA considerations. The results of the ExA's considerations and the Secretary of State's own views on this matter are presented below.

Under Regulation 24 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, the ExA (on behalf of the Secretary of State) undertook two screenings. The first screening was undertaken on 12 June 2017 [OD-005]. It was concluded that significant effects on the environment of European Economic Area states were likely. A notice was placed in the London Gazette on 30 June 2017 and the following states were notified:

- Belgium;
- Denmark;
- France;
- The Netherlands;
- Germany;
- Iceland;
- Sweden; and
- Norway.

France, Belgium, Denmark, Norway and the Netherlands responded, requesting to be involved in further consultation in relation to the Proposed Development. None of the other states responded.

Following the acceptance of the application for Examination, the second screening was undertaken on 19 June 2018. Consultation letters were sent to the states which had previously requested further involvement, offering the opportunity for them to register as Interested Parties. No additional states were identified as being likely to have significant effects on their environment. On a precautionary basis, notification letters were re-sent to the states which did not respond to the previous Regulation 24 notification (Germany, Iceland and Sweden).

France responded by noting the receipt of the consultation letter but did not respond further. Sweden confirmed that it did not wish to participate further. No other comments were received during the Examination. None of the states consulted or notified requested to be registered as Interested Parties.

Potential transboundary impacts were considered in the ES Transboundary Impacts Screening [APP-099] with relevant matters carried forward to the individual topic chapters of the ES.

The Secretary of State notes that the Applicant considered non-UK European sites in its Application and it concluded that there would be no likely significant effect from the Project alone and in-combination for all non-UK European sites. The ExA did not note any objections to this conclusion in its recommendation report.

8 Marine Conservation Zone Assessment

As set out in section 1.4 Part 5 of the MACAA provides powers for Ministers to designate Marine Conservation Zones ("MCZs") alongside a duty to exercise this power to contribute to the creation of a network of Marine Protected Areas.

In the assessment (below) the Secretary of State, as the public authority who will determine the application for authorisation, will consider aspects of the Project capable of affecting the protected features of an MCZ, or any ecological or geomorphological processes on which a feature depends, other than insignificantly.

The MMO submitted their guidance for assessing MCZs at Deadline 3 of the Examination [REP3-096]. This guidance usefully sets out the assessment stages set out in the MACAA, the stages being as follows:

1. Screening
    - Decisions at this stage based upon standing advice, existing evidence base and information supplied by Applicant.
    - Is the licensable activity taking place within or near an area being put forward for or already designated as an MCZ?; and
    - Is the activity capable of affecting (other than insignificantly) either (i) the protected features of an MCZ; or (ii) any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant.

2. Stage 1 MCZ Assessment (section 126(6) of the MACAA), use information supplied by the applicant with the licence application, advice from the SNCBs and any other relevant information to determine whether;
    - there is no significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ; and
    - the public authority can exercise its functions to further the conservation objectives stated for the MCZ (in accordance with section125(2)(a) of MACAA)

If the condition in section 126(6) of the MACAA cannot be met, the stage 1 assessment will also consider whether the condition in s.127(7)(a) can be met. In doing so the MMO will determine whether;

- there is no other means of proceeding with the act which would create a substantially lower risk of hindering the achievement of the conservation objectives stated for the MCZ. This should include proceeding with it (a) in another manner, or (b) at another location.

3. The stage 2 assessment will consider whether the conditions in section 126(7)(b) and (c) of the MACAA can be met. In doing so the Public Authority will use information supplied by the applicant, advice from the SNCBs and any other relevant information to determine whether;
    - the benefit to the public of proceeding with the act clearly outweigh the risk of damage to the environment that will be created by proceeding with it; and, if so, then whether
    - the applicant can satisfy the public authority that they will undertake or make arrangements for the undertaking of measures of equivalent environmental benefit to the damage which the act will or is likely to have in or on the MCZ.

In their Marine Conservation Zone Assessment [APP-104] the Applicant undertook a screening of the MCZs on which the Project could have an impact on the conservation objectives. The Applicant concluded that the construction/decommissioning and operational phases of the Project could have an effect on the conservation objectives of the Cromer Shoal Chalk Beds MCZ and Markham's Triangle MCZ.

The Secretary of State has undertaken stage 1 assessments for both these MCZs.

8.1 Stage 1 Assessment: Cromer Shoals Chalk Beds MCZ

The Cromer Shoal Chalk Beds MCZ, which came into effect on 29 January 2016, lies approximately 200 m from the low water mark off the north Norfolk coast and extends 10 km out to sea in waters of up to 25 m depth, covering a total area of approximately 321 km^2. The chalk and flint shores of north Norfolk represent one of the few coastal outcrops of bedrock in eastern England. The chalk shores are considered a rare habitat in northwest Europe. Off the east coast of England, the reef at North Norfolk is thought to be the longest, with a length of approximately 30 km.

The draft conservation advice for this site is to maintain or secure the favourable condition of each of its designated features which are as follows [REP7-070]:

- High energy circalittoral rock;
- High energy infralittoral rock;
- Moderate energy circalittoral rock;
- Moderate energy infralittoral rock;
- North Norfolk coast (subtidal);
- Peat and clay exposures;
- Subtidal chalk;
- Subtidal coarse sediment;
- Subtidal mixed sediments; and
- Subtidal sand.

The Applicant, with agreement from NE, identified that the cable export corridor would only overlap with the subtidal sand feature [REP9-016].

Draft targets have been set for a range of physical and biological attributes of this feature. Operations likely to affect its conservation status include cable burial, protection, maintenance and decommissioning. However, the effects of the cabling associated with Dudgeon and Sheringham Shoal Offshore Wind Farms (OWF) on this site are yet to be assessed by NE. The following targets would potentially be affected by the export cable route:

- maintain the presence and spatial distribution of subtidal sand communities;
- maintain the distribution of sediment composition types across the feature;
- maintain all hydrodynamic and physical conditions such that natural water flow and sediment movement are not significantly altered;
- maintain the species composition of component communities;
- maintain the total extent and spatial distribution of subtidal sand; and
- maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.

The draft conservation advice suggests that the first four targets (above) could change to “recover” rather than “maintain” if offshore infrastructure were to affect the site and lead to an unfavourable condition assessment.

Although TWT agreed that there would be no significant effect on the site, subject to the outcome of related monitoring [REP9-024], there remained a number of outstanding areas of disagreement with NE. These are:

- the ability to bury cables;
- rock protection assumptions and decommissioning;
- recovery of sandwaves following clearance work; and
- the effect of horizontal directional drilling (HDD) exit pits.

8.1.1 Cable burial

NE questioned the Applicant's ability to reach an optimum cable burial depth and minimise the need for rock protection. NE also highlighted the need for further geotechnical evidence in order to demonstrate that the installation tools would be capable of achieving the necessary burial depths.

The Applicant undertook an assessment which indicated that three different trenching methodologies would be feasible along the export cable route, namely jet trenching, mechanical trenching and cable plough trenching. It concludes that the last two methodologies could be consistently applied along the entire cable route in combination with hydro-assisted jet trenching where looser sediments occur. This assessment covers the trenching tools that were characterised in the original project envelope [APP-058]. It also highlights the fact that a harder grade of the chalk than would otherwise be encountered in the export cable corridor was successfully trenched at Rampion OWF. Despite having a higher shear strength, the necessary target burial depth was nevertheless achieved.

The ExA accepted that the trenching assessment provided by the Applicant is sufficiently robust as they saw no substantiated technical evidence to suggest that the ground model is fundamentally flawed or that the trenching tools that have been evaluated are incapable of penetrating the geological formations that have been described.

8.1.2 Sandwave recovery

The Applicant's geophysical survey data suggest that small sandwaves characterise the export cable route where it coincides with the subtidal sand feature [REP5-010 and REP6-026]. The Applicant has highlighted the fact that the export cable route at Race Bank passes through similarly dynamic areas of seabed characterised by highly mobile sediments with migrating bedform features [APP-061].

The Applicant submitted that subsequent monitoring at Race Bank showed that after five months either partial or full recovery had occurred at ten out of 12 monitoring locations comprising 14 out of 19 sandwaves [REP1-183]. A further bathymetric monitoring report, including data from 2018, concluded that the seabed had either completely recovered or was close to recovering to pre-construction levels along most of the 9 monitoring locations that were selected [REP2-020].

NE accepts that the first document provided "some confidence" that sandwaves would recover but question how analogous the Race Bank example would be to this Project [REP3-076]. In particular, whether the same conclusions apply within the MCZ.

The ExA consider that whilst the dynamic environment in the MCZ may be similar to Race Bank, it is unclear whether there would be sufficient sediment available to ensure recovery of shallower sandwave features along this section of the export cable route given the proximity of different sediments to the surface of the seabed.

The Applicant states that the total impact on the sandwave feature would amount to 1.04% of its area within the MCZ. The Applicant considers that this would be a temporary effect because the feature would recover.

However, on the evidence provided during Examination, the ExA were considered that while some of the affected area would recover they were not confident that all of it would. They advised that, a significant impact cannot be ruled out, even though the precise extent of this impact cannot be determined.

The ExA state that impacts from sandwave clearance would add to the lack of sandwave recovery in areas affected by rock protection measures and any associated decommissioning. In addition, the ExA consider that the recovery of sandwaves could be compromised where underlying sediments are exposed through a combination of post levelling erosion and the excavation of divergent substrata that would be deposited onto surrounding areas of intact subtidal sand.

As previously discussed in Section 5.6 The Secretary of State is aware that results from the monitoring of similar impacts at other designated sites have shown a high potential for habitat recovery following cable burial and that although not identical, the results are relevant and provide the best available evidence to assessing potential impacts within this MCZ. The Secretary of State recognises that there is uncertainty over the extent of the residual impact arising from the laying of cables. However, the maximum area impacted by cable laying is 1.03% of the MCZ and, based on the best available scientific evidence the majority, if not all, of which is predicted to recover.

8.1.3 Rock Protection

Following a request for further information by the Secretary of State the Applicant has reviewed the maximum extent of cable protection that may be required within the MCZ and has reduced the maximum percentage of cable requiring protection from 10% to 7% and reducing the area of seabed impacted from 4,200 m^2 to 2,940 m^2; a reduction of 28.9% from the original assessment (Ørsted 2020)[94].

NE's concerns raised during Examination regarding the worst-case scenario for the length of export cable within the MCZ requiring rock protection is discussed at length in Section 5.6, assessing impacts on the North Norfolk Sandbanks and Saturn Reef SAC. Although the reduction in the area potentially impacted within the MCZ has been welcomed by NE, their concerns over the long-term changes in sediment movement due to rock protection remain (Natural England 2020)[95].

The MMO suggests that remedial cable protection works should be subject to separate marine license applications during the operation phase of the project because they would constitute new construction works rather than what might strictly be construed as maintenance works [REP9-082]. This position is consistent with earlier representations [REP7-103, REP7-104 and REP6-072] and is supported by NE [REP7-076].

The MMO proposed draft condition wording to the effect that any cable protection authorised under the DCO is required to be deployed within 15 years of the issue date of the Order [REP9-082]. The Applicant maintains that this would not be necessary because the remedial protection is included in the 10% worst-case scenario estimate and therefore does not need to be assessed a second time through a separate marine license application [REP10-045].

The ExA recommend that the wording of the conditions suggested by the MMO which means any rock protection authorised under the DCO should be deployed within 15 years of the DCO issue date otherwise a further Marine License is required, should be incorporated into the final Order if granted.

[94] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020.

[95] Natural England (2020). *Hornsea Project Three – Applicant's submission to Secretary of State Consultation Request for further information*. 22 April 2020.

The Applicant's reduced maximum cable protection could impact on 0.016% of the subtidal sand feature of the site. As a result, the Applicant concludes that it would not pose a significant risk to the achievement of the conservation objectives for the site [REP10-045](Ørsted 2020)[96].

However, The ExA considers that any rock protection used within the MCZ would clearly be contrary to the stated conservation targets. Namely, to maintain the distribution of sediment composition types and subtidal sand communities as well as the total extent of the subtidal sand feature.

The ExA accepts that the recovery of some ecological function arising from infaunal and epifaunal colonisation of rock berms may occur [REP1-138], this would not be an appropriate substitute for the loss of a designated feature or represent adequate mitigation for this loss. This is because it would have fundamentally different physical and ecological characteristics as a result of its larger particle size (100 mm to 250 mm) and graded 2 m high profile. This would subject rock berms to different geophysical processes in comparison to the surrounding seabed.

NE advised that the placement of cable protection should be viewed as a permanent impact in the absence of empirical evidence to the contrary [REP7-076]. MMO also has concerns regarding the feasibility of rock protection decommissioning [REP7-104].

Regarding the feasibility of rock protection decommissioning within MPAs the ExA is satisfied that the Applicant has established that existing equipment, in the form of a backhoe dredger or trailing suction hopper dredger, would be capable of removing rock protection within the MCZ as well as other MPAs [REP6-018]. However, the ExA concludes that this only shows the logistical feasibility of removing rock protection rather than the recoverability of the feature.

The ExA also notes that the positioning system for the rock removal methods is such that 30 cm of the seabed below the rock protection would be removed. Given that the sandy Holocene sediments that coincide with the MCZ export cable corridor route show a variation in depth of 1 m or less in Figure 4.3 of the Preliminary Trenching Assessment [REP5-010 and REP6-026], the chances of exposing different stratigraphies and the permanent loss of the feature cannot be ruled out.

As discussed in Section 5.6 the Secretary of State is conscious of previous decisions taken on wind farm applications and the reasoning behind them where impacts on sandbank habitats within a SAC (The Dogger Bank SAC) from very similar activities as those being assessed here have been subject to HRAs (DECC 2015a, b) [97] [98]. The decisions were made on the basis that following the removal of the wind

[96] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020.

[97] DECC (2015a). *Record of the Habitats Regulations Assessment undertaken under regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) and regulation 25 of the Offshore Habitats Regulations for an Application under the Planning Act 2008 (As Amended**).** Dogger Bank Teesside A and B Offshore Wind Farm*. 4 August 2015.

[98] DECC (2015b). *Record of the Habitats Regulations Assessment undertaken under regulation 61 of the Conservation of Habitats and Species Regulations 2010 (as amended) and regulation 25 of the Offshore Habitats Regulations for an Application under the Planning Act 2008 (As Amended**).** Dogger Bank Creyke Beck Offshore Wind Farm.* 17 February 2015.

farm(s) and their associated deposits at the time of decommissioning the habitat would recover with recovery of ecology occurring within months/few years after decommissioning [99] [100].

The area of sandbank habitat predicted to be impacted in the long-term is less than previously considered at other designated sites, where no adverse impacts were concluded on the basis that at the time of decommissioning, the Project will undertake the complete removal of all Project related infrastructure and associated deposits.

The requirement to remove all infrastructure and associated deposits within the MCZ will be secured within the DCO and the subsequent decommissioning programme that is be required under The Energy Act 2004. Consequently, The Secretary of State is satisfied that the potential for impacts on sandbank features as a result of the Project would not lead to a significant impact on Cromer Shoal Chalk Beds MCZ.

8.1.4 HDD exit pits

NE were concerned HDD exit pits (where the horizontal directional drilling emerges from the substrate) would either expose different site features that have not been assessed or that impacts would arise from disposal activities, particularly in relation to the proposed coffer dams [REP4-130].

However, the ExA consider that there are sufficient measures and practices written into the CSIP and considered within the ES for neither the HDD exit pits nor coffer dams (used at the pits) to lead to significant impacts on the designated features of the MCZ.

As per the recommendations of the ExA, the Secretary of State considers that the HDD exit pits would not lead to a significant impact on the designated features of the MCZ.

8.1.5 Overall Conclusions

The Secretary of State recognises the disagreements between NE, the MMO and the Applicant. He has considered the representations made by the Applicant, NE, and the MMO and the recommendation as made by the ExA.

Given the identified impacts on the sandwave features of the MCZ from sandwave clearance and rock cable protection, the Secretary of State considers that there would, over a small proportion of the site, be a long-term but temporary loss to the extent and distribution of one of the designated features, namely sandwaves. At the time of decommissioning all Project related infrastructure and associated deposits will be removed and the habitat is predicted to recover. Consequently, the potential impacts will not be permanent and therefore not cause a significant effect on the Cromer Shoal Chalk Beds MCZ.

8.2 Stage 1 Assessment: Markham's Triangle MCZ

The northeast section of the Project array area would overlap with Markham's Triangle MCZ.

[99] The Planning Inspectorate (2014). *The Planning Act 2008 Dogger Bank Creyke Beck Offshore Wind Farm Examining Authority's report of findings and conclusions and recommendation to the Secretary of State for Energy and Climate Change*. 17 November 2014.

[100] The Planning Inspectorate (2015). *The Planning Act 2008 (as amended) Dogger Bank Teesside A and B Offshore Wind Farms Examining Authority's report of findings and conclusions and recommendation to the Secretary of State for Energy and Climate Change*. 5 May 2015.

At the time of Examination, this site was a proposed MCZ, however, as the site was designated in May 2019[101], sections 125 and 126 of the MACAA are engaged and as such it will be assessed as a full MCZ.

Markham's Triangle MCZ was designated for subtidal seafloor habitats predominantly associated with coarse sediments and sand. It covers an area of approximately 200 km^2 and lies approximately 137 km from the Humberside coastline on the eastern side of England.

The broadscale habitats that are the features against which conservation objectives are set are as follows:

- Subtidal coarse sediment;
- Subtidal mixed sediment;
- Subtidal sand; and
- Subtidal mud.

During Examination, NE submitted that the most widespread habitat is subtidal coarse sediment with an approximate area of 145.56 km^2. The next most dominant being subtidal mixed sediment (27.54 km^2) followed by subtidal sand (26.35 km^2) and then subtidal mud (1.49 km^2). NE highlights the fact that subtidal mud is not within the order limits and consequently need not be assessed [REP7-073].

As the MCZ is newly designated, there are no formal conservation objectives. However, the Applicant used the Cromer Shoal Chalk Beds MCZ conservation advice package as a proxy for the purposes of the application [REP9-016]. NE confirmed that this was an acceptable basis for the assessment of Markham's Triangle MCZ. The consultation document for the site set a general target to restore all the features to favourable condition [REP7-073].

By the end of Examination, the Applicant and NE disagreed on the following:

- the extent of impact and effect on each habitat; and
- rock protection and decommissioning.

Following Examination the Secretary of state requested further information regarding whether there are any other means of proceeding with the project which would create a substantially lower risk of achieving the conservation objectives of the site (BEIS 2019) [102].

Subsequent to the request the Applicant has committed to avoiding placement of any infrastructure (i.e. foundations, scour protection, cables and associated cable protection) within the boundary of Markham's Triangle MCZ [103]. This commitment will be secured within an updated DCO.

Consequently, there will be no physical impact on any of the features within the Markham's Triangle MCZ and the Secretary of State, considers that the Project will not have an adverse effect on the designated features of the MCZ.

[101] 2019 no. 24. *The Markham's Triangle Marine Conservation Zone Designation Order 2019*. http://www.legislation.gov.uk/ukmo/2019/24/created

[102] BEIS (2019). *Request for information and comments on late representations received by the secretary of state, and notification of the secretary of state's decision to set a new date for determination of the application.* Letter dated 27 September 2019

[103] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020

9 Marine Conservation Zone Assessment Overall Conclusions

The Secretary of State has carefully considered all of the information presented before, during and subsequent to the Examination. He has considered the representations made by Interested Parties, and the ExA's report itself.

The Secretary of State has undertaken a stage 1 assessment on the Cromer Shoal Chalk Banks MCZ identified and

has ruled out beyond reasonable scientific doubt, significant risk of the activity hindering the achievement of the conservation objectives stated for the MCZ on the basis that although the potential impacts would be lasting (for the duration of the project), they will temporary (reparable effect) and therefore not affect the conservation objectives of the site.

Following a request by the Secretary of State for information the Applicant has confirmed that there will be no infrastructure within the Markham's Triangle MCZ and consequently no impacts that could affect the conservation objectives of the site.

10 Consideration of the Case for Derogation

On the basis of the AA the Secretary of State cannot ascertain, within reasonable scientific doubt, the absence of an adverse effect from the Project, in combination with other projects, on the integrity of the FFC SPA with respect to the kittiwake feature.

The Secretary of State has therefore reviewed the project in the context of Regulations 64 and 68 of the Conservation of Habitats and Species Regulations 2017 to determine whether the project can be consented.

Regulation 64 allows for the consenting of a project that is required for imperative reasons of overriding public interest ("IROPI"), even though it would cause a negative adverse effect on the integrity of a European site ("AEOI").

Consent may only be given under Regulation 64 where no alternative solutions to the project are available which are less damaging to the affected European site and where Regulation 68 is satisfied.

Regulation 68 requires the appropriate authority to secure any necessary compensatory measures to ensure that the overall coherence of Natura 2000 is protected.

In accordance with guidance on the application of HRA published by the Planning Inspectorate (Advice Note 10) and DEFRA (2012), this part of the project review has followed a sequential process whereby:

- alternative solutions to the Project have been sought;
- consideration has been given to whether there are IROPI for the Project to proceed; and
- compensation measures proposed by the Applicant for ensuring that the overall coherence of Natura 2000 is protected have been assessed.

The Secretary of State is satisfied that there are no alternative solutions to the Project and that there are IROPI for the project to proceed. However, the proposed compensation measures do not provide the necessary confidence that their implementation would successfully achieve their aims.

The Secretary of State is therefore minded to give consent to the Project subject to measures being identified for the satisfaction of Regulation 68 of the Conservation of Habitats and Species Regulations 2017.

The reasoning in support of these conclusions are set out in the following sections of this HRA report.

11 Alternative Solutions

In reaching his conclusion the Secretary of State has given regard to the objectives of the Project as described by the Applicant (Ørsted, 2020)[104] and has considered how these objectives could be met by alternative means.

11.1 Project Objectives

The Applicant outlines a series of objectives for the Project[104], which include those that define the strategic function of the project within the UK energy strategy and others that have been adopted to influence certain aspects of the design of the development or reflect the geographical constraints available to the Applicant.

1. Support decarbonisation and security of supply by developing a large-scale offshore wind farm;
2. Develop a project at low cost to consumer;
3. Deliver a significant volume of offshore wind in the 2020s;
4. Promote further offshore wind farm, through Round 3 offshore wind leasing round, via further development within former Hornsea Zone;
5. Develop the eastern portion of the former Hornsea Zone, (due east of Hornsea One and Hornsea Two);
6. Develop an array which makes efficient use of available seabed within the eastern portion of former Hornsea Zone;
7. Make efficient use of available grid connection capacity;
8. Secure consent which allows construction in either one or two phases;
9. Secure consent to allow AC or DC transmission technology, to ensure delivery in first half of 2020;
10. To utilise the shortest and straightest feasible export cable corridor route from the offshore array area to landfall site; and
11. To be delivered in a safe and efficient manner.

Various points supporting or explaining the rationale for each objective is also provided by the Applicant[104]. Whereas these may be valid objectives for the Applicant to help frame the development of the Project, they are not all essential for the consideration of alternative solutions.

Having regard to the suite of objectives identified by the Applicant in the context of National Policy Statements on energy (EN-1)[105], renewable energy infrastructure (EN-3)[106] and electricity networks infrastructure (EN-5)[107], the Secretary of State considers the primary objectives of the Project to be:

- **To generate low carbon electricity from an offshore wind farm in support of the decarbonisation of the UK electricity supply.**
- **To export electricity to the UK National Grid to support UK commitments for offshore wind generation and security of supply.**

[104] Ørsted (2020). *Response to the Secretary of State's Consultation 2 - Appendix 1: Shadow HRA Derogation Case.* Table 4.3. Ørsted. February 2020

[105] Department of Energy & Climate Change. Overarching National Policy Statement for Energy (EN-1). TSO, 2011.

[106] Department of Energy & Climate Change. National Policy Statement for Renewable Energy Infrastructure (EN-3). TSO, 2011.

[107] Department of Energy & Climate Change. National Policy Statement for Electricity Networks Infrastructure (EN-5). TSO, 2011.

Beyond this, many of the Applicant's objectives for the Project are necessarily set within the UK Government's mechanisms for promoting the development of offshore wind, notably the licensing of leases by The Crown Estate for areas of the seabed to be developed, and the purchase of low carbon electricity through Contracts for Difference[108]. Hence, for example, the Applicant's focus on development within the former Hornsea Zone.

In his assessment of alternatives, the Secretary of State has not constrained himself solely to those alternatives that could be delivered by the Applicant. Nevertheless, the Secretary of State acknowledges that any alternative must be economically feasible for the developer and investors and allow the developer to fulfil the terms of its lease with The Crown Estate. This is captured by a third objective:

- **To maximise generation and export capacity within the constraints of the available sites and onshore transmission infrastructure.**

Furthermore, given that the development of offshore wind is driven by the need to limit the magnitude and impacts of climate change, and that the earlier that steps towards decarbonisation are introduced the greater will be their contribution to limiting climate change, the Secretary of State considers that a key objective of the Project is to be operational at the earliest date. This is captured by the Applicant's Objective 3:

- **To deliver a significant volume of offshore wind in the 2020s.**

In conclusion it is considered that the benefits from the Project to the UK society and / or to the developer could alternatively be provided by any project with the following objectives:

- To generate low carbon electricity from an offshore wind farm in support of the decarbonisation of the UK electricity supply.
- To export electricity to the UK National Grid to support UK commitments for offshore wind generation and security of supply.
- To optimise generation and export capacity within the constraints of available sites and onshore transmission infrastructure.
- To deliver a significant volume of offshore wind in the 2020s.

11.2 Identification of Alternatives

In accordance with guidance published by DEFRA, the Secretary of State does not consider the development of alternative forms of energy generation to meet the objectives for the Project. Alternatives to the Project considered by the Secretary of State are consequently limited either to Do Nothing or to alternative wind farm projects.

Alternative types of wind farm projects considered are:

- Offshore wind farms not in UK Exclusive Economic Zone (EEZ);
- Offshore wind farms within UK EEZ, including:
    - Within the former Hornsea Zone;
    - At other locations available to the Applicant;
    - Within other Zones leased from The Crown Estate by other developers;
    - Within Zones to be leased by The Crown Estate under the Licensing Round 4.

[108] https://www.gov.uk/government/collections/electricity-market-reform-contracts-for-difference

11.3 Consideration of Alternatives

11.3.1 Do Nothing

Not proceeding with the Project would remove the risk of direct impacts to the Kittiwake feature of the FFC SPA but would not meet the Project objectives and would hinder the wider need to deploy offshore wind generation at scale, before 2030, to help the UK to meet its commitments under the Climate Change Act 2008 (as amended) to mitigate the effects of climate change.

The benefits from the Project are established in the Applicant's Statement of Need[109] and referred to within the subsequent Section 11 of the HRA report. This includes the context of the Project within the scale and timeframe required in UK offshore wind development.

The Crown Estate records that there is currently 34.6 GW of offshore wind capacity from projects that are at least at the Pre-planning stage through to those in operation. To meet the UK Government's ambitions additional wind farm projects need to be identified and brought through development, consent, construction and commissioning. The Crown Estate has calculated that this process typically takes around ten years after the leasing process for an area has been completed.

The Do Nothing alternative would further erode the capacity anticipated to be operational by 2030, putting additional reliance on as-yet unidentified projects to meet the Government's ambitions.

11.3.2 Offshore wind farms not in UK EEZ

The Secretary of State does not consider offshore wind farm projects that are located outside UK territorial waters as being an alternative to the Project since this would not meet the objective to support the decarbonisation of the UK electricity supply and UK commitments on offshore wind generation.

Although the UK is party to international treaties and conventions in relation to climate change and renewable energy, according to the principle of subsidiarity and its legally binding commitments under those treaties and conventions, the UK has its own specific legal obligations and targets in relation to carbon emission reductions and renewable energy generation. Other international and EU countries similarly have their own (different) binding targets. Sites outside the UK are required for other Member States and countries to achieve their own respective targets in respect of climate change and renewable energy.

11.3.3 Offshore wind farms within the former Hornsea Zone

Alternative options for meeting the Objectives could include a different scale of windfarm within the footprint of the Project or the use of a different part of the seabed within the former Hornsea Zone leased by the Applicant.

Alternative Scale

Determining the viable scale of an offshore wind project must be considered in the context of the specific characteristics of the individual project and the highly competitive commercial framework within which the project is being delivered, set against the scale of the need. It is not possible to set an envelope that only responds to environmental impacts. Key factors which influence the design envelope promoted for a project are:

- distance from the grid connection point;
- project generation capacity and commercial expectations prescribed by funding mechanisms (such as CFD);

[109] Ørsted (2020). *Response to the Secretary of State's Consultation - Appendix 1 Annex C: Statement of Need – Planning Act 2008*. Ørsted. February 2020

- construction costs of array, transmission and grid connection;
- technology availability, cost and reliability;
- health and safety considerations during construction, operations and decommissioning;
- local (UK) content supply chain objectives and supply chain capacity; and
- project execution schedule.

These project specific considerations must be considered within the context of the UK government's policy objective, to support the development of a domestic offshore wind industry, which delivers large scale, low cost renewable generation. To date, the cost of offshore wind has fallen dramatically, and future projects will need to continue to be cost competitive. Stable policies and a steady pipeline of projects has provided developers and wider supply chain with the confidence to make significant investments. This has driven down the cost of offshore wind through scale, innovation and industrialisation, with projects securing record low prices at £39.65/MWh, in the latest CFD auction in 2019.

Through the development and consent application period the Applicant has re-appraised elements of the MDS for the Project to minimise residual impacts to the environment, including to European sites, while maintaining a commercially attractive project.

Measures considered to decrease the collision risk of Kittiwake have included the following:

- reducing the number of turbines;
- reducing the maximum rotor swept area;
- increasing the height of turbine blades above sea surface; and
- constraints on operational period (e.g. turbine shut-down during breeding periods).

Following publication of the Examining Authorities report, the Applicant has selected larger turbines for the Project. This allows the minimum height of the turbine blades to be increased to 40m MSL / 41.8m LAT, thereby moving the rotor swept area to altitudes where kittiwake densities are lower due to the skewed nature of bird flight height distribution (Johnston *et al*., 2014[110]). No further improvements can be achieved in this regard since the supply chain needed to support lift heights associated with larger structures (foundations and towers) does not currently exist. The Applicant is not aware of any existing tower suppliers or wind turbine installation vessels which have the capability to lift blades to heights greater than 40 m MSL on turbines with hub heights above 150 m.

The larger turbines selected have an increased generation capacity which has enabled the Applicant to reduce the maximum number of turbines that it needs to deploy for the Project to remain economically viable.

Collision risk modelling supplied by the Applicant for the reduced number of larger turbines demonstrates a reduced collision risk for kittiwake (refer to Annex B of Appendix 4 to Applicant's Response[111]).

Further reduction in the intersection of the swept path with kittiwake flight zones would require use of shorter rotors on the highest feasible towers. This would lead to a reduction in generating capacity and impact on the economic viability of the Project.

The imposition of temporary operational shutdowns of turbines can only realistically be considered for species with a distinct and well-established migratory behaviour which occurs over a brief period of time.

[110] Johnston, A., Cook, A. S., Wright, L. J., Humphreys, E. M., and Burton, N. H. (2014). Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. *Journal of Applied Ecology, 51(1), 31-41.*

[111] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 4: Post Examination Mitigation and Project Envelope Modifications*. Ørsted. February 2020

Cleasby *et al*. (2018)[112] indicates that Hornsea Three does not appear to represent an important area for kittiwake from the FFC SPA during the breeding season. Thus, there is no distinct season to implement a temporary shutdown for kittiwake and no single period correlates to a focused period of activity by kittiwake across the array (Refer to the Applicant's Ornithological Comparison Data (July 2019)[113]. Kittiwake are present in only relatively low numbers year-round in the Hornsea Three site. There is no evidence to suggest that a temporary shutdown would provide an alternative solution that has less impact on the kittiwake feature of the FFC SPA while maintaining the economic viability of the Project.

Economic viability includes, inter alia, the ability for the operator to optimise the potential to reduce generation costs per MW and demonstrate continual decrease in the Levelised Cost of Electricity (LCoE) beyond that established in recent CFD auction. This is acknowledged to be necessary to serve value for UK electricity consumers and to allow the Applicant to put forward a financially viable proposition in future CFD auction rounds and thereby ensure a secure outlet for electricity generated by the Project.

Other parts of the Former Hornsea Zone

The Crown Estate own and/or hold the exclusive rights to manage the leasing of seabed for offshore wind development within UK territorial waters and the UK Exclusive Economic Zone, with seabed made available for offshore wind development selectively, in successive offshore leasing rounds, usually several years apart.

For the Licensing Round 3, the identification of zones for development was the output of a spatial planning process by the Government and The Crown Estate involving Strategic Environmental Assessment to identify relative levels of constraint and opportunity. The assessment included a Plan-level Appropriate Assessment by The Crown Estate of its plan to award 9 Zones for Development Agreements (ZDAs). The location and boundaries of the former Hornsea Zone were determined by The Crown Estate through this process.

The Applicant secured leasing rights from The Crown Estate for the area of seabed formerly designated as the Hornsea Zone.

The Crown Estate initially established a target capacity of 4GW of generating capacity, to be met through the development of multiple offshore wind farm sites within the former Hornsea Zone. The identification of project sites within the former Hornsea Zone was carried out by the Applicant using the process of Zone Appraisal and Planning as recommended by The Crown Estate specifically for Leasing Round 3 and endorsed within NPS EN-3. This process was designed to identify areas of least constraint and greatest opportunity. Details in relation to identification of the areas for the Hornsea projects (One, Two and Three) are provided in section 4.6 of Volume 1, Chapter 4: Site Selection and consideration of alternatives of the ES.

The Applicant has received consent for two projects within the former Hornsea Zone with a combined capacity of 2.6 GW, and the Project seeks to increase the total installed capacity within the zone.

Hornsea Projects One and Two, in the central part of the former Hornsea Zone, were pursued first and have been consented on the basis there would be no AEOI alone or in combination, and are no longer available. Nor do these projects constitute alternative solutions to Hornsea Three. The targets for offshore wind have increased, not reduced since the consenting of these projects, and their existence does not

[112] Cleasby, I. R., Owen, E., Wilson, L. J., and Bolton, M. (2018). Combining Habitat modelling and hotspot analysis to reveal the location of high density seabird areas across the UK: Technical Report. RSPB Research Report no. 63.

[113] Ørsted (2019). *Hornsea Project Three Offshore Wind Farm (EN010080) - Ornithological Comparison Data*. 31 July 2019

lessen the scale or urgency of the need for further large-scale offshore wind projects, either in general terms or within the former Hornsea Zone.

Prior to selecting the Hornsea Three array area, the Applicant assessed the remaining available seabed within the former Hornsea Zone. On the information available at that time, the Hornsea Three site was preferred based on constraint and technical analysis and the desire to make efficient use of the available seabed and to make efficient use of available grid connection capacity.

Given the foraging range of a number of the qualifying species of FFC SPA, all possible locations for commercial scale offshore wind farms within the former Hornsea Zone have connectivity with one or more species from the FFC SPA. It is noted that the location of Hornsea Three is as far from FFC SPA as possible to achieve within the former Hornsea Zone. It is therefore unreasonable to expect that any other location with the former Hornsea Zone would provide an alternative solution to the project that would have lesser impact to the FFC SPA.

The Secretary of State concludes that there are no viable alternative solutions to the Project within the former Hornsea Zone.

11.3.4 Offshore wind farms at other locations available to the Applicant

The Applicant is not involved in development of any Round 3 ZDA other than the former Hornsea Zone.

The Applicant has developed 11 offshore wind farms in the UK under earlier leasing rounds (Rounds 1, 2, 2.5), either alone or in partnership.

Each of these projects has been fully built out, subject to the limitations of environmental constraints, and do not offer potential for further development. These operational wind farms form part of existing UK offshore wind capacity.

11.3.5 Offshore wind farms within zones leased by alternative developers

Although not considered by the Applicant, it is feasible in principle that the objectives of the Project could be met by alternative solutions from developers other than the Applicant. The potential for such alternatives to Hornsea Three is considered here.

Licensing Round 3 and earlier

The spatial approach adopted by The Crown Estate for Licensing Round 3 identified multiple ZDAs with each ZDA expected to deliver multiple projects up to a set Zone-level target.

It is inherent to such an approach that neither the Zones, nor the projects within the Zones, can be reasonably treated as alternatives to one another, otherwise the overall target will not be delivered. As such other Round 3 developments do not constitute potential alternative solutions to Hornsea Three.

Locations identified by The Crown Estate in prior leasing rounds (Rounds 1, 2, 2.5) are already under exclusivity to other offshore wind developers and subject to offshore wind developments which are operational, in construction, consented or have existing plans for future developments. Those locations form part of the existing baseline of projects and do not provide potential as alternatives to Hornsea Three.

Wind farm Extension Projects

Development rights have been awarded for extensions to seven existing windfarm developments. If all seven extensions are completed to maximum capacity this would result in a total of 2.85 GW additional capacity.

None of the individual extension projects would deliver the capacity that can be delivered by Hornsea Three. Rather, several projects would need to be developed in parallel, to deliver the same benefit as Hornsea Three.

The purpose of the extension projects is to provide additional capacity rather than to cover a capacity gap created by the abandonment or deferral of any Round 3 projects.

The extension projects have yet to enter the planning consent process. The Plan level HRA concluded that these would not result in adverse effect on the integrity of European Sites, but project level HRAs are still required. It is possible that some of these extension projects could be operational by 2030 if it is possible to accelerate their development ahead of average historic timescales for offshore wind and would depend on consents being in place to allow participation in a CFD auction round in or around 2025/2027.

Licensing Round 4

At present, the only alternative locations that are potentially available are locations within the bidding areas identified by The Crown Estate for Leasing Round 4.

The Round 4 offshore wind leasing round is designed to deliver between 7 and 8.5 GW of additional capacity projects. This is subject to a plan level HRA that has yet to be carried out and may affect the shape, scale and timing of development. The maximum individual project size is set at 1.5 GW so no individual project progressed via Round 4 will make the same contribution as Hornsea Three. It is also recognised that with rights due to be awarded in 2021, and mindful of typical development timescales, only some of these projects could be generating power within the 2020s.

11.4 Conclusion on Alternatives

The ExA considered information on alternatives submitted by the Applicant and IPs. It considered it to be reasonable to focus on other potential sites for offshore wind energy, and was satisfied that alternatives had been properly considered at a project design level. Being mindful that information provided by the Applicant was preliminary in nature the ExA recommended that further information should be sought from the Applicant and relevant SNCBs. This was requested by the Secretary of State in his letter of 27th September 2019.

Following review of the information submitted by the Applicant and SNCBs in response to his letter the Secretary of State remains in agreement with the preliminary conclusions of the ExA.

Having identified the objectives of the Project and considered all alternative means of fulfilling these objectives, the Secretary of State is satisfied that no alternative solutions are available.

12 Imperative Reasons of Overriding Public Interest (IROPI)

The HRA Derogation Provisions provide that a project having an AEOI on a European site may proceed (subject to a positive conclusion on alternatives and provision of any necessary compensation) if the project must be carried out for IROPI.

This section of the HRA sets out to determine whether the Project is required for IROPI.

The HRA Derogation Provisions identify certain in-principle grounds of IROPI that may be advanced in favour of such a project. For projects, such as Hornsea Three, where the AEOI relates to sites designated under the Birds Directive, but not to priority species or priority habitats under the Habitats Directive, grounds for IROPI may include human health, public safety, beneficial consequences of primary importance to the environment, and social or economic benefits.

The parameters of IROPI are explored in guidance provided by DEFRA[114] and the European Commission[115] , which identify the following principles:

- Imperative – Urgency and importance: There would usually be urgency to the objective(s) and it must be considered "indispensable" or "essential" (i.e. imperative). In practical terms, this can be evidenced where the objective falls within a framework for one or more of the following
    - (i) actions or policies aiming to protect fundamental values for citizens' life (health, safety, environment);
    - (ii) fundamental policies for the State and the Society; or
    - (iii) activities of an economic or social nature, fulfilling specific obligations of public service.
- Public interest: The interest must be a public rather than a solely private interest (although a private interest can coincide with delivery of a public objective).
- Long-term: The interest would generally be long-term; short-term interests are unlikely to be regarded as overriding because the conservation objectives of the Habitats and Birds Directives are long term interests.
- Overriding: The public interest of development must be greater than the public interest of conservation of the relevant European site(s).

The Secretary of State is satisfied that there are imperative reasons of overriding public interest for the Project to proceed subject to adequate compensatory measures being implemented.

In arriving at his decision, the Secretary of State has reviewed how the Project provides a public benefit which is essential and urgent despite the harm to the integrity of the kittiwake feature of the FFC SPA that will result from the Project in combination with other operational, consented and planned developments.

The decision is predicated by the principal and essential benefit of the Project as a significant contribution to limiting the extent of climate change in accordance with the objectives of the Paris Agreement. The consequences of not achieving those objectives would be severely deleterious to societies across the globe, including the UK, to human health, to social and economic interests and to the environment.

The need to address climate change is the principle tenet behind the Climate Change Act 2008, and subsequently published National Policy Statements for energy (EN-1)[105], renewable energy infrastructure

[114] Habitats and Wild Birds Directives: guidance on the application of article 6(4). Alternative solutions, imperative reasons of overriding public interest (IROPI) and compensatory measures. DEFRA, 2012.

[115] Managing Natura 2000 Sites: The provisions of Article 6 of the ‘Habitats’ Directive 92/43/EEC. European Communities, 2000

(EN-3)[106] and electricity networks (EN-5)[107] provide a framework for delivering the UK's international commitments on climate change.

Measures set out in the NPS have been given further impetus to reflect evolving understanding of the urgency of actions to combat climate change, including the legally binding commitment to reduce greenhouse gas emissions to net zero by 2050, made in July 2019.

The Government's strategy for decarbonisation to achieve this commitment relies on contributions from all sectors delivered through multiple individual projects implemented by the private sector. The Government has also set up schemes to facilitate the deployment of such projects and to provide the public with value for money, such as via the Contracts for Difference scheme.

The Government anticipates that decarbonisation will lead to a substantially increased demand for electricity as other power sources are at least partially phased out or transformed. Simultaneously the supply of electricity must decarbonise. This will require the establishment of a reliable and secure mix of low-carbon electricity sources, including large-scale development of offshore wind generation. The scale of the contribution of offshore wind to the electricity supply mix is reflected in the targets set by the Government.

Offshore wind generation schemes can only be developed through the mechanism put in place by The Crown Estate for leasing areas of the seabed in a structured and timely way. Projects which make a significant contribution to meeting the target capacity in the timeframe required are therefore both necessary and urgent.

These considerations are expanded on and substantiated in the following section.

Additional, subsidiary beneficial consequences of primary importance to the environment, to human health, and social and economic benefits from the Project are noted but are not deemed essential.

12.1 The National Policy Statements (NPSs)

12.1.1 Establishing the basis provided by the 2011 NPSs

The NPSs were established against obligations made as part of the Climate Change Act 2008 ('CCA2008') – see Section 12.2.1 following. The overarching National Policy Statement for Energy (NPS EN-1)[105] sets out national policy for energy infrastructure in Great Britain (GB). It has effect, in combination with NPS EN-3 (for renewable energy infrastructure)[106] and NPS EN-5 (for electricity networks)[107], on recommendations made by the Planning Inspectorate ('PINS') to the Secretary of State for BEIS on applications for energy developments that fall within the scope of the NPSs[116]. These NPSs, when combined with the relevant technology-specific energy NPS, provide the primary basis for decisions by the Secretary of State. The NPS set out a case for the need and urgency for new energy infrastructure to be consented and built with the objective of supporting the Government's policies on sustainable development, in particular by:

- Mitigating and adapting to climate change, and
- Contributing to a secure, diverse and affordable energy supply[117].

The NPS for renewable energy infrastructure cover those technologies which, at the time of publication in 2011, were technically viable at generation capacities of over 50 MW onshore and 100 MW offshore.

[116] NPS EN-1 Para 1.1.1

[117] NPS EN-3 Para 1.3.1

This includes offshore wind, and as such the need for this technology is fully covered by the NPS. In addition, progress has been made by other low-carbon technologies and initiatives which were expected to deliver a low-carbon electricity system, and these may contribute to addressing a growing urgency (informed by developing scientific opinion) to reduce carbon emissions globally and locally.

The arguments which support a national need for low-carbon infrastructure made today are consistent with those arguments contained in the NPSs, and indeed:

> *The Secretary of State is of the view that the NPSs clearly set out the specific planning policies which the Government believes both respect the principles of sustainable development and are capable of facilitating, for the foreseeable future, the consenting of energy infrastructure on the scale and of the kinds necessary to help us maintain, safe, secure, affordable and increasingly low carbon supplies of energy*[118].

The analysis contained in the NPS documents is extended here to cover low-carbon electricity generation against today's climate, security of supply and cost of generation status. It develops the arguments made within EN-3[106] for large offshore wind technology, and extends them to demonstrate firstly that there is now even more need for this technology in GB; secondly that this technology is now even more technically and economically feasible than it was in 2011; and thirdly, that large-scale offshore wind can and will bring benefits for GB. These benefits manifest in terms of the technology's contribution to legal decarbonisation targets; security of supply; and affordability of electricity for GB consumers.

The NPSs set out the national case and establish the need for certain types of infrastructure, as well as identifying potential key issues that should be considered by the decision maker. S104 of the Planning Act (2008)[119] makes clear that where an NPS exists relating to the development type applied for, the Secretary of State must have regard to it. The NPSs provide specific policy in relation to offshore wind development, and the policies set out in NPS EN-1, EN-3 and EN-5 therefore apply.

This national need relates both to the decarbonisation of the electricity supply within the required timeframe and to the risk the decarbonisation programme could pose to the security of electricity supply as more traditional generating stations are decommissioned.

With regard to the latter, consideration has been given to the ruling in case C-411/17 by the European Court of Justice[120] that the objective of ensuring the security of the electricity supply in a Member State constitutes an IROPI.

The policies within NPSs EN-1, EN-3 and EN-5 which are of particular relevance and importance to this examination are set out in Section 12.1.2.

12.1.2 A synthesis of the 2011 National Policy Statements EN-1 and EN-3

At the time the NPSs were published, scientific opinion was that, to avoid the most dangerous impacts of climate change, the increase in average global temperatures must be kept to no more than 2°C. Global emissions must therefore start falling as a matter of urgency[121].

[118] Department for Business, Energy and Industrial Strategy (BEIS). Drax Re-powering Decision Letter of 4 October 2019. BEIS, 2019. Para 4.13

[119] http://www.legislation.gov.uk/ukpga/2008/29/contents

[120] Judgement of 29. 7. 2019 – Case C-411/17 Inter-Environnement Wallonie and Bond Beter Leefmilieu Vlaanderen. ECLI:EU:2019;622

[121] NPS EN-1 Para 2.2.8

The energy NPSs were intended to speed up the transition to a low carbon economy and help the UK to realise its climate change commitments sooner than would a continuation under the current planning system[122]. They recognise that moving to a secure, low carbon energy system to enable the UK to meet its legally binding target to cut greenhouse gas emissions by at least 80% by 2050, compared to 1990 levels, is challenging, but achievable. This would require major investment in new technologies to electrify heating, industry and transport, and cleaner power generation[123]. Under some 2050 pathways, electricity generation would need to be virtually emission-free, because emissions from other sectors were expected still to persist[124]. Consequentially, the need to electrify large parts of the industrial and domestic heat and transport sectors could double electricity demand by 2050[125].

The NPS conclude that the UK needs sufficient electricity capacity from a diverse mix of technologies and fuels[126], and therefore the UK also needs all the types of energy infrastructure covered by the NPSs in order to achieve energy security at the same time as dramatically reducing greenhouse gas emissions[127]. Thus, all applications for development consent for the types of infrastructure covered by the energy NPSs should be assessed on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described within EN-1 Part 3. Substantial weight should therefore be given to the contribution which projects would make towards satisfying this need for a secure, low carbon, electricity supply when considering applications for development consent under the Planning Act 2008[128,129]. The economic feasibility of harvesting sufficient available natural resource will be an important driver for proposed locations of renewable energy projects[130].

To hit the target of UK commitments to sourcing 15% of energy from renewable sources by 2020, and to largely decarbonise the power sector by 2030, the NPSs conclude that it is necessary to bring forward new renewable electricity generating projects as soon as possible. The need for new renewable electricity generation projects is therefore urgent.

Offshore wind farms are expected to make up a significant proportion of the UK's renewable energy generating capacity up to 2020 and towards 2050[131].

12.2 The United Kingdom has a legal commitment to decarbonise

This section sets out the obligations of CCA2008, against which the NPSs (2011) were established. It then outlines the UK's 2019 legally binding commitment to achieving 'Net-Zero' carbon emissions by 2050, against which the need for future electricity generation developments should be assessed.

[122] NPS EN-1 Para 11.7.2

[123] NPS EN-1 Para 2.2.1

[124] NPS EN-1 Para 2.2.6

[125] NPS EN-1 Para 2.2.22

[126] NPS EN-1 Para 2.2.20

[127] NPS EN-1 Para 3.1.1

[128] NPS EN-1 Para 3.1.3

[129] NPS EN-1 Para 3.1.4

[130] NPS EN-3, Para 2.6.57

[131] NPS EN-3 Para 2.6.1

12.2.1 Climate Change Act 2008

The Government, through CCA2008, set legally binding carbon targets for the UK[132], aiming to cut emissions (versus 1990 baselines) by 34% by 2020 and at least 80% by 2050, 'through investment in energy efficiency and clean energy technologies such as renewables, nuclear and carbon capture and storage'[133].

CCA2008 is underpinned by further legislation and policy measures. Many of these have been consolidated in the UK Low Carbon Transition Plan ('LCTP')[133], and UK Clean Growth Strategy[134]. A statutory body, the Committee on Climate Change ('CCC'), was also created by CCA2008, to advise the UK and devolved Governments and Parliaments on tackling and preparing for climate change, and to advise on setting carbon budgets. The CCC report regularly to the Parliaments and Assemblies on the progress made in reducing greenhouse gas emissions. The UK government has set five-yearly carbon budgets which currently run until 2032. The UK has met its first and second carbon budgets and is on track to outperform the third (2018 to 2022).

Up to 2019, the UK had made progress with its carbon reduction obligations, as shown in Figure 3, through significant reductions in the power, industry and waste sectors. CCA2008 obligations translate to a total emissions target of ~550 $MtCO_2e$ in 2020. The main driver of UK carbon reduction to date has been the power generation sector. Overall carbon intensity from power generation has fallen significantly in recent years, with (virtually) carbon- free generation (wind, solar, hydro, bioenergy, and nuclear) accounting for around 54% of electricity generation in 2019[135]. CCA2008 committed the UK to sourcing 15% of its total energy (across the sectors of transport, electricity and heat) from renewable sources by 2020 and new projects were expected to need to continue to come forward urgently to ensure that this target was met. Government projections made in 2011 suggested that by 2020 about 30% or more of GB electricity generation – both centralised and small-scale – could come from renewable sources, compared to 6.7% in 2009[136].

All industry sectors have important roles to play in decarbonisation, but so far carbon reductions outside of power, industry and waste have been small. Electrification of non-power sectors is therefore an important part of the realisation of overall carbon emission reductions. Indeed:

> *Moving to a secure, low carbon energy system is challenging, but achievable. It requires major investment in new technologies to renovate our buildings, the electrification of much of our heating, industry and transport, prioritisation of sustainable bioenergy and cleaner power generation*.[137]

Decarbonisation of transport will be supported by removing internal combustion engines from roads, potentially by introducing electric vehicles (in private, public and commercial vehicles), and/or by improving electrified rail services as an efficient substitute to road freight. Residential savings in carbon emissions are currently being pursued by research into the substitution of gas (currently used in homes for space and water heating and cooking) for electricity (or hydrogen). In order to deliver those savings,

[132] The commitment to decarbonise extends across the United Kingdom of Great Britain and Northern Ireland. Northern Ireland is interconnected with the mainland power system through interconnectors, but is operated under a different electricity market framework. Therefore, hereinafter we refer to Great Britain ('GB') in relation to electricity generation and transmission, and the UK, to refer to the nation which has legally committed itself to Net-Zero carbon emissions by 2050

[133] HM Government. The UK Low Carbon Transition Plan. HMSO, 2009. Five Point Plan.

[134] BEIS. The Clean Growth Strategy. HMG, 2017 (Corrected 2018).

[135] Simon Evans. UK low-carbon electricity generation stalls in 2019. Carbon Brief, 2020.

[136] NPS EN-1 Para 3.4.1

[137] NPS EN-1 Para 2.1.1

it is vitally important to ensure that GB is capable of meeting an increased demand for electricity in a secure way, with a significantly lower carbon intensity even than current levels.

The future characteristics of GB's electricity demands are described through a set of possible scenarios developed (through industry consultation) on an annual basis by GB's Electricity System Operator and statutory undertaker, National Grid Electricity System Operator ('National Grid ESO'). This annual publication is called Future Energy Scenarios ('FES')[138]. In completing their work National Grid ESO look at a number of inputs including legislation, policy, technology and commercial drivers. Consumer behaviour is also considered. The speed of decarbonisation is a key feature in both the 2018 (vs. CCA2008) and 2019 (vs Net-Zero – see Section 12.2.2) publications of FES, with two of the four scenarios meeting the 2050 carbon reduction target via distinct pathways: requiring heavy investment in either energy efficiency, or electricity decarbonisation. In reality, these pathways are not mutually exclusive, and Government and industry are currently pursuing initiatives which cover both.

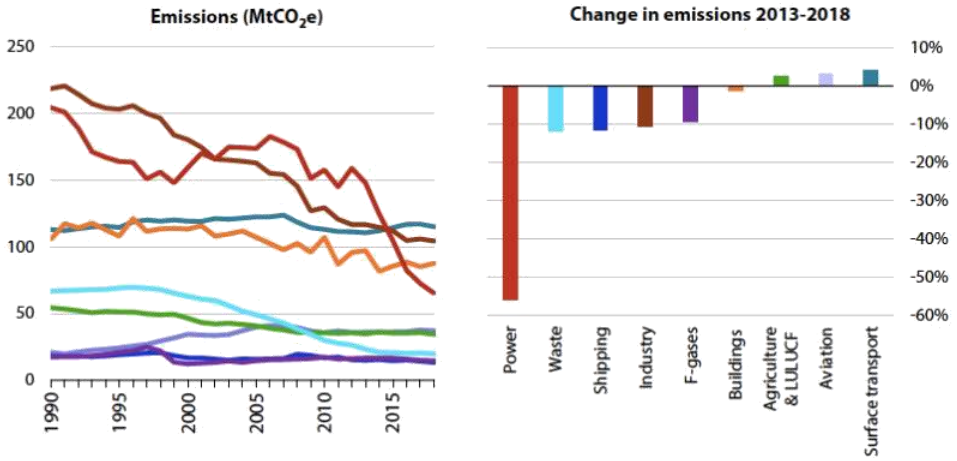

Figure 3: UK greenhouse gas emissions by source sector, 1990 - 2018[139].

Both the future scenarios in Figure 4, below, show that, consistent with the NPS, the UK's pathway to a successful 2050 greenhouse gas target must still involve wider transitions outside of the power generation sector: decarbonisation of transport, industry, agriculture and the home, remains required to reduce non-power sector emissions. To enable these transitions, it is clear that the power generation sector must increase in capacity and reduce in carbon intensity on an unprecedented scale. This has been a consistent theme since the first FES was published in 2012. Importantly, both successful scenarios shown in Figure 4 include the commissioning of large capacities of low-carbon (solar, offshore wind and/or nuclear) power generation, among other initiatives to facilitate emissions reduction in other sectors.

12.2.2 Recent enhancements of existing UK Government policy on climate change: Net-Zero

The UK context for the need for greater capacities of low-carbon UK generation to come forward with pace, has continued to develop through 2018/19. In October 2018, following the adoption by the UN Framework Convention on Climate Change of the Paris Agreement, the Intergovernmental Panel on Climate Change ('IPCC') published a 'Special Report on the impacts of global warming of 1.5°C above pre-industrial levels'. This report concludes that human-induced warming had already reached approximately 1ºC above preindustrial levels, and that without a significant and rapid decline in emissions

[138] National Grid. Future Energy Scenarios. National Grid, 2019. http://fes.nationalgrid.com/fes-document/. Accessed 02/01/2020.

[139] Committee on Climate Change. Net Zero - The UK's contribution to stopping global warming. 2019.

across all sectors, global warming would not be likely to be contained, and therefore more urgent international action is required.

In response, in May 2019, the CCC published their report called: 'Net-Zero: The UK's contribution to stopping global warming.'[139]. This report recommended that government extend the ambition of CCA2008 past the delivery of net UK greenhouse gas savings of 80% from 1990 levels, by 2050. The CCC recommend that 'The UK should set and vigorously pursue an ambitious target to reduce greenhouse gas emissions (GHGs) to 'Net-Zero' by 2050, ending the UK's contribution to global warming within 30 years.' The CCC believe that this recommendation is 'necessary [against the context of international scientific studies], feasible [in that the technology to deliver the recommendation already exists] and cost-effective', reporting that 'falling costs for key technologies mean that . . . renewable power (e.g. solar, wind) is now as cheap as or cheaper than fossil fuels.' Importantly, the CCC recommendation identifies a need for low-carbon infrastructure development which is consistent with the need case set out in NPS EN-1, but points to an increased urgency for action.

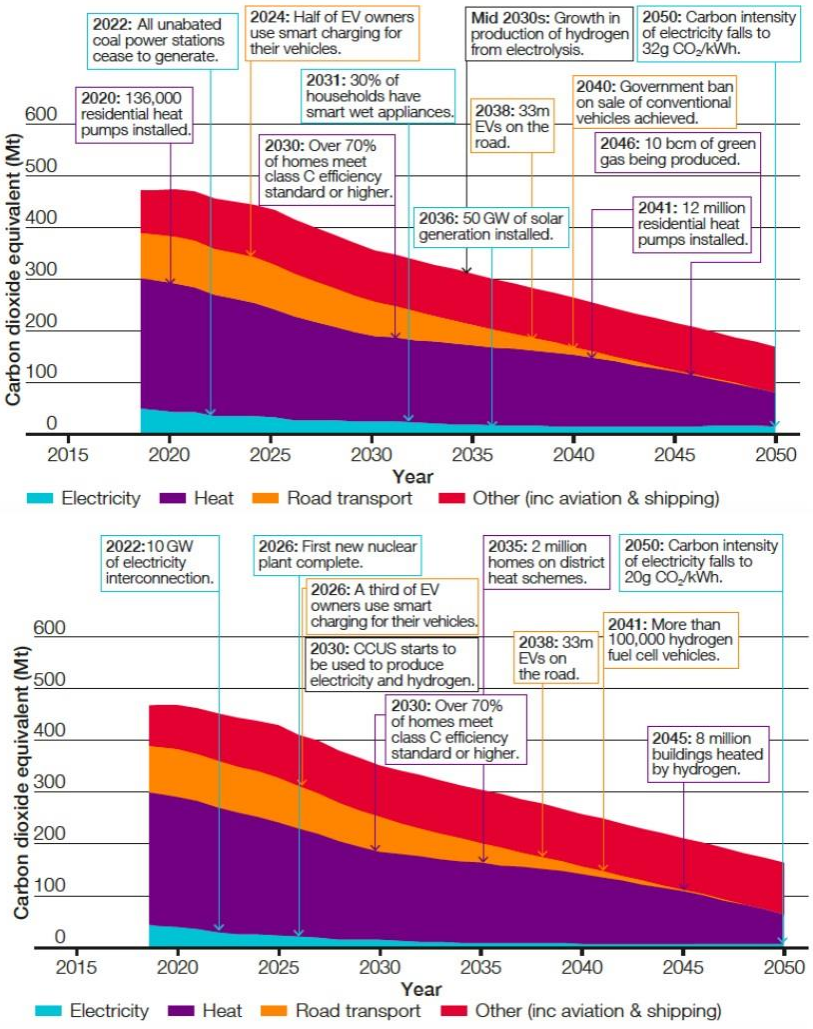

Figure 4: Successful pathways to 2050 commitments, showing the importance of a whole-society approach to decarbonisation and low carbon electricity generation[140].

[140] National Grid. Future Energy Scenarios. National Grid, 2018. Figures 3.1 and 3.2.

In June 2019, the Government announced the laying of a statutory instrument in Parliament, which amends CCA2008, in order to implement the CCC's recommendation into law. This came into force on 27 June 2019, making the UK the first major economy to pass laws to end its contribution to global warming by 2050.

Earlier (in March 2019) Government announced its ambition to deliver at least 30 GW of offshore wind by 2030, as part of the Offshore Wind Sector Deal (the 'Sector Deal')[141]. The Sector Deal reinforces the aims of the UK's Industrial Strategy and Clean Growth Strategy, which seeks to maximise the advantages for UK industry from the global shift to clean growth, and in particular: 'The deal will drive the transformation of offshore wind generation, making it an integral part of a low-cost, low-carbon, flexible grid system.' Within supplementary documents to the Queens Speech, December 2019[142], Government committed to 'increase [their] ambition on offshore wind to 40 GW by 2030, and enable new floating turbines'. GB currently has 9.2 GW of Transmission Entry Capacity already allocated to offshore wind developments with a status of 'built'; with projects totalling a further 34.5 GW currently with status of either 'scoping', 'awaiting consents', 'consents approved' or 'under construction / commissioning'[143].

The inclusion of a project on a 'future project pipeline' does not indicate that the project will go ahead, or if it does, at a particular generation capacity. It is therefore not the case that the ambitions of the Sector Deal, nor the newly adopted government policy, will certainly be met by those projects currently under consideration by developers. Within this context, the importance of all offshore wind projects currently under development, to the achievement of Government policy and pledges, is clear. Without Hornsea Three[144], it is very possible that delivery of the Sector Deal and the UK government's 2030 ambition will fall short.

Figure 3 illustrates the reduction in carbon emissions from electricity generation which has been achieved since 1990. Despite this reduction, the CCC conclude that extending the ambition of CCA2008 is not credible unless decarbonisation progresses with far greater urgency than currently exists, not just within electricity generation, but also in other energy uses, including low-carbon heating systems in the built environment, and the electrification of transport, with most sectors needing to reduce emissions to close to zero. The increased electrification of primary energy use will double-down on the requirement to reduce carbon emissions from electricity generation even further than that which has already been achieved. The CCC describes one scenario (consistent with National Grid ESO's FES): that of 'extensive electrification, particularly of transport and heating, supported by a major expansion of renewable and other low-carbon power generation.' The report goes on to describe that 'the scenarios involve around a doubling of electricity demand, with all power produced from low-carbon sources (compared to 50% today)'[139]. This, coupled with National Grid ESO's own forecasts of the deployment of low-carbon generation in the UK, leads to the conclusion that, in order for the UK to achieve Net-Zero, all possible use is made from the resources and infrastructure available for low-carbon developments.

The decarbonisation of GB's electricity generation assets is therefore of vital importance in meeting the UK's legal obligations on carbon intensity. The 2019 update to FES was published around the same time that Government implemented the CCC's recommendation in law. FES 2019 analysis is therefore aligned with that of the CCC and provides an approach to achieve Net-Zero emissions by 2050. National Grid ESO conclude that the 80% decarbonisation target can be reached through multiple technology

[141] BEIS. Offshore wind Sector Deal. BEIS Policy Paper, 2019.
[142] HM Government, The Queen's Speech 2019 – background briefing notes. https://assets.publishing. service.gov.uk/government/uploads/system/uploads/ attachment_data/file/853886/ Queen_s_Speech_December_2019_-_background_briefing_notes.pdf, 2019 p116
[143] National Grid. TEC Register. https://www.nationalgrideso.com/connections /registers-reports- and-guidance, Accessed 08/01/2020, July 2020.
[144] Which holds a Grid Connection Agreement, is listed on National Grid's TEC Register under the status 'Scoping', and which could be built out in one or two phases by the mid 2020s.

pathways, but that achieving Net-Zero requires greater action across all solutions. Action on electrification, energy efficiency and carbon capture will all be needed at a significantly greater scale than assumed in any core scenarios[138].

Five important predictions from National Grid ESO's analysis[(145)138] are that, by 2030:

- GB electricity demand will grow up to 5% by 2030 as a result of electrification of transport & home heating, with demand up by between 30 and 50% by 2050;
- GB installed generation capacity will need to increase (from 110 GW today) to 130 – 160 GW by 2030 to meet demand (i.e. a 36 – 66 GW increase, following nuclear (8 GW) & coal closures (also 8 GW) pre 2030), with indicatively 53-66% of that capacity being low-carbon (vs. 48% today);
- Installed capacity will need to grow even further after 2030 to meet demand and carbon targets;
- That there are potentially many ways to meet the CCA2008 2050 80% reduction target – but critically that not all pathways will meet this target, therefore work remains to be done in decarbonisation; and
- That in order to meet the 'Net-Zero' target, a radical transformation to our national energy ecosystem is required, meaning even more low-carbon, wind and solar generation capacity than even the most ambitious scenarios currently envisage, will be required to meet the UK's legally binding targets.

Three important points arising from this study are:

- Experts have concluded, and Government has agreed, that decarbonisation in the UK needs to be deeper and broader than it has previously been considered;
- Broad electrification is a fundamental requirement for broad and deep national decarbonisation; and
- More low-carbon generation, from diverse sources, along with energy efficiency and electricity storage is required to meet the anticipated increase in electricity demand.

In conclusion, offshore wind is recognised as being an important technology for low-carbon generation and the urgent need for large capacities of low-carbon generation is clear to avoid compromising security of electricity supply. Specifically, Hornsea Three will be a necessary part of the future generation mix, and as such will make a valuable contribution in the direction of adopted UK Government policy and achievement of decarbonisation commitments.

[145] FES 2019 includes early sensitivity analysis for reaching Net-Zero by 2050

13 Compensatory Measures

In the Secretary of State's letter of 27th September 2019 the Applicant was invited to provide evidence as to any compensatory measures proposed to ensure that the overall coherence of the network of European sites for kittiwake is protected. The measures were to be by way of compensation for the impact of the Project, in combination with other developments, on the kittiwake feature of the FFC SAC.

In response to this request the Applicant submitted a Kittiwake Compensation Strategy[146] which outlines how a Kittiwake Compensation Plan will be developed by the Applicant in cooperation with Natural England, the RSPB and other potentially interested parties. The Plan would require approval from the Secretary of State no less than one year prior to work commencing on the installation of any wind turbine generator foundation.

The Kittiwake Compensation Strategy proposes to enhance the productivity of an, as yet unspecified, colony of kittiwake through a programme of eradication of invasive mammalian predators. The strategy includes for continued vigilance that eradication is maintained.

The Applicant's Kittiwake Compensation Strategy outlines a method for selecting an appropriate island location, or locations, for the predator eradication programme taking regard of the:

- Suitability of the site for kittiwake;
- Presence of predators;
- Existing eradication programmes;
- Proximity of the site to wind farms, either existing, planned or with potential for future development;
- Proximity to existing SPA designated for kittiwake;
- Proximity of SPAs designated for great skua – a natural predator species of kittiwake; and
- Projections for future spatial density distributions of sandeel – a major prey resource for breeding kittiwake.

The Applicant acknowledges that there may be limited potential to identify an appropriate site that is near to the FFC SPA and suggests that sites further afield within the UK are more likely to meet the criteria. Whereas the compensation would consequently not benefit the FFC colony directly, it should not preclude fulfilling the requirement to preserve the coherence of the network of kittiwake Natura 2000 sites if it benefits the wider Eastern Atlantic population of kittiwake generally.

An increase in kittiwake productivity is proposed as the success criterion, with the targeted level of increase being related to the level of impact concluded for the kittiwake of the FFC SPA. Productivity increase would be established through breeding seabird census. If the success criteria were not met the Applicant commits to replicating the Kittiwake Compensation Plan at an alternative location.

A predator eradication of 100% would be targeted and re-infestation monitored throughout the operational period of the Project. The means of achieving eradication are not presented in the Applicant's Kittiwake Compensation Strategy, but it proposes that the method will be developed in consultation with SNCBs and the RSPB taking the UK Rodent Eradication Best Practice Toolkit (2018) into account.

The Secretary of State has reviewed the Applicant's proposed strategy and also responses to the strategy submitted by the SNCB and other interested parties.

[146] Ørsted (2020). *Response to the Secretary of State's Consultation Appendix 2B: Kittiwake Compensation Strategy*. Ørsted. February 2020

The Secretary of State concludes that at present the Applicant's Kittiwake Compensation Strategy contains insufficient evidence to give the required level of confidence that the proposed approach could be successfully applied to compensate for the level of impact to the FFC SPA. Agreement in principle has not been reached with SNCBs on the feasibility of the method and there remain significant potential obstacles to its implementation. The Secretary of State consequently considers that there is insufficient certainty of success of the proposed measure for this to form the basis of a condition of the DCO.

By way of example, and notwithstanding other concerns, the Secretary of State concurs with the opinions provided by Natural England and the RSPB that, whereas it is reasonable to conclude that a successful method of eradication can be developed, it is questionable whether predator eradication would result in an increase in the breeding productivity of kittiwake.

Since kittiwakes usually nest on narrow ledges on tall, vertical or near-vertical cliffs that are not accessible to mammals, predation by land mammals is rare and that there is little evidence to support the suggestion that this predation would impact the productivity of a kittiwake colony unless food resource is plentiful. This may present an underlying flaw in the proposed strategy, and robust evidence would need to be provided to demonstrate that kittiwakes will benefit.

The Kittiwake Compensation Strategy does not specify an approach for securing agreements for land access and, as highlighted by Natural England, any proposals to implement measures within other countries would need the involvement from their Relevant Authorities and advisory bodies.

14 Derogation Conclusion

The Secretary of State concludes that the Project, in combination with other developments, would give rise to impacts to the kittiwake feature of the FFC SPA which would adversely impact the integrity of that site for kittiwake.

The Secretary of State is satisfied that there are no alternatives to fulfilling the objectives of the Project and that the Project provides a benefit that is imperative to the public interest. The Secretary of State is also satisfied that the public benefits of the project would over-ride the impacts to the FFC SPA if appropriate compensation is identified.

The Secretary of State does not believe that sufficient information has been provided to date to give the required level of confidence that necessary compensatory measures have been secured that will ensure the overall coherence of Natura 2000 sites for kittiwake.

As a result the Secretary of State is currently not yet in a position to decide whether to grant consent to the Project under Regulation 64 of the Conservation of Habitats and Species Regulations, since Regulation 68 has not been met.

However, the Secretary of State is minded to give consent for the development to proceed subject to receiving satisfactory evidence of compensation measures to be put in place to ensure compliance with the Conservation of Habitats and Species Regulations. In relation to this the Secretary of State therefore requires a detailed Compensation Plan which gives confidence that any compensatory measures proposed will be sufficient to offset the impact to the kittiwake feature of the FFC SPA and thereby maintain the coherence of the network of SPAs designated, at least in part, for kittiwake.

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Date: June 2020