

Vattenfall Wind Power Ltd Thanet Extension Offshore Wind Farm

Report to Inform Appropriate Assessment

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Vattenfall Wind Power Ltd
Thanet Extension Offshore Wind Farm
Report to Inform the Appropriate Assessment June
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1 Introduction

1.1 Background to the project

1.1.1 Vattenfall Wind Power Ltd (VWPL) is proposing the development of the Thanet Extension Offshore Wind Farm (Thanet Extension). The project would be located approximately 8 km offshore (at its closest point) from the Kent coast, in proximity to the operational Thanet Offshore Wind Farm (TOWF). It would have up to 34 Wind Turbine Generators (WTGs), with a maximum capacity each of 12+ MW, resulting in a generation capacity of up to 340 MW. Electricity generated would be transported to the shore by offshore export cables installed within the Offshore Export Cable Corridor (OECC) to the landfall location at Pegwell Bay, then through underground cables and/ or surface lay cables installed within the Onshore Cable Corridor (OCC) to the proposed onshore substation located at Richborough Port.

1.1.2 The location of Thanet Extension (including the wind farm array, offshore and onshore cable corridors and the onshore substation) is presented in Figure 1.1. More detail on the project is provided within the full Environmental Statement (ES), specifically within the following chapters and annexes:

- Volume 1, Chapter 1: Introduction (Document Ref: 6.1.1), providing an overview of the project, VWPL, the technical specialists involved and where and how to view project literature;
- Volume 1, Chapter 2: Policy and Legislation (Document Ref: 6.1.2), providing an overview of the key policy and legislation driving the need for the project and governing the processes and requirements to be followed and applied by VWPL;
- Volume 1, Chapter 3: Environmental Impact Assessment Methodology (Document Ref: 6.1.3), describes the assessment methodology used throughout the Environmental Impact Assessment (EIA) to identify and evaluate potential impacts associated with the development of Thanet Extension;
- Volume 1, Chapter 4: Site Selection and Alternatives (Document Ref: 6.1.4), providing detail on the selection of the site including alternatives considered;
- Volume 2, Chapter 1: Project Description (Offshore) (Document Ref: 6.2.1), providing a description of the offshore elements of the proposed development, including the project design and proposed methods of construction, Operations and Maintenance (O&M), and decommissioning;
- Volume 3, Chapter 1: Project Description (Onshore) (Document Ref: 6.3.1), providing a description of the onshore elements of the proposed development, including the project design and proposed methods of construction, O&M, and decommissioning; and

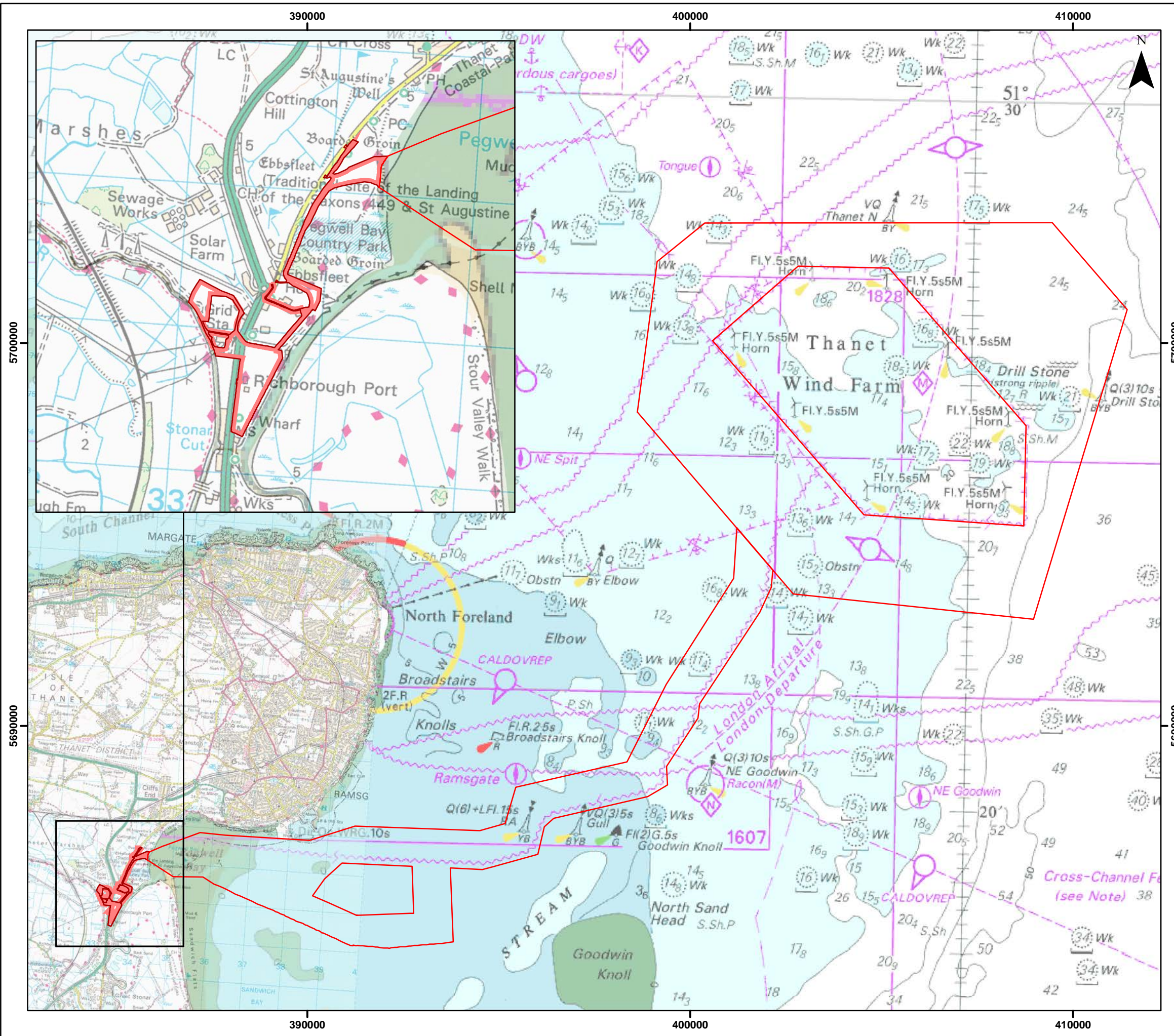
- Volume 1, Annex 3-1: Cumulative Impact Assessment (Document Ref: 6.1.3.1), providing details on the methodologies for each of the cumulative assessments and justification for the approach taken.

THANET EXTENSION OFFSHORE WIND FARM

Figure 1.1
Thanet Extension Development Area

Legend

- Offshore Red Line Boundary
- Onshore Red Line Boundary



Datum: ETRS 1989
Projection: UTM31N



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 Ordnance Survey 0100031673
 0 1 2 km 0 0.55 1.1 nm
 1:100,000

Drg No	Fig1.1_LocationMap			Figure 1.1
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

1.2 Purpose of the report

1.2.1 The European Commission's guidance on Assessment of plans and projects significantly affecting Natura 2000 sites (2001), identifies a staged process to the assessment of the effects of plans and projects on European sites. Together, these stages are referred to as the Habitats Regulations Assessment (HRA), in order to clearly distinguish the whole process from the second stage within it, which is referred to as the 'Appropriate Assessment' (AA). There are potentially up to four stages to the HRA process:

- Screening;
- Appropriate Assessment;
- Assessment of alternatives; and
- Imperative Reasons of Overriding Public Interest (IROPI) and compensation.

1.2.2 This document has been produced as part of the overall HRA process for Thanet Extension. This report draws on the Screening Report (Annex 1 to this report) undertaken in 2017. The first draft of the Screening Report was issued to consultees in June/ July 2017 and re-issued in September 2017 as part of the Evidence Plan. A summary of the consultation process, including comments received and how/ where these are addressed, is provided in section 4.

1.2.3 It is noted that further project specific survey work has been conducted following the issue of the Screening Report, together the finalisation of technical reporting and further refinements to the project design including additional embedded mitigation. Therefore, the conclusions of the September 2017 Screening Report have been revisited here, to confirm where the conclusions remain valid together with where and why any such conclusions have changed (including, where relevant, the addition of further designated sites and updates relevant to the recent European Court of Justice (ECJ) ruling (see paragraph 2.1.6)). The updated conclusions on screening are presented in section 4.1.8.

1.2.4 This document applies the conclusions on the potential for a Likely Significant Effect (LSE), as drawn in the Screening Report, and updated here in section 7, with respect to the conservation objectives of the screened in European sites, to determine the potential for an Adverse Effect on Integrity (AEoI). It is the information on the potential for an AEoI that is required by the competent authority (in this case the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS)), although all LSE, including any that may be regulated by other competent authorities, have been addressed in order to undertake the AA (hence the document title 'Report to Inform Appropriate Assessment', or RIAA, applied here).

1.3 Project Literature

1.3.1 This RIAA has not been prepared in isolation, but instead forms part of a suite of documents being submitted as part of the application process. These documents include technical reports (both for site specific survey but also modelling and desk based studies), with many of these being the key source documents for the information (baseline and assessments) presented here. For ease of reference, and to minimise repetition, the main sources of project literature (including relevant ES chapters) for the current report are as follows:

- Offshore:
 - Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref 6.2.2);
 - Volume 4, Annex 2=1: Physical Processes – Technical Baseline (Document Ref 6.4.2.1);
 - Volume 2, Chapter 4: Offshore Ornithology (Document Ref 6.2.4);
 - Volume 4, Annex 4-1: Offshore Ornithology – Baseline Technical Report (Document Ref 6.4.4.1);
 - Volume 4, Annex 4-2: Offshore Ornithology – Collision Risk Modelling (Document Ref 6.4.4.2);
 - Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref 6.2.5);
 - Volume 4, Annex 5-1: Benthic Ecology – Subtidal Technical Report (Document Ref 6.4.5.1);
 - Volume 4, Annex 5-2: Benthic Ecology – Intertidal Survey (Document Ref 6.4.5.2);
 - Volume 2, Chapter 6: Fish and Shellfish Ecology (Document Ref 6.2.6);
 - Volume 4, Annex 6-1: Fish and Shellfish – Technical Report (Document Ref 6.4.6.1);
 - Volume 2, Chapter 7: Marine Mammals (Document Ref 6.2.7);
 - Volume 4, Annex 6-3: Underwater Noise Technical Report (Document Ref 6.4.6.3);
 - Volume 2, Chapter 8: Offshore Designated Sites (Document Ref 6.2.8);
 - Volume 2, Chapter 10: Shipping and Navigation (Document Ref 6.2.10); and
 - Volume 4, Annex 10-1: Navigation Risk Assessment (Document Ref 6.4.10.1).
- Onshore:

- Volume 3, Chapter 5: Onshore Biodiversity (Document Ref 6.3.5);
- Volume 5, Annex 5-3: Baseline Onshore and Intertidal Ornithology Report (Document Ref: 6.5.5.3);
- Volume 5, Annex 5-6: Terrestrial Invertebrate Assessment Report (Document Ref: 6.5.5.6); and
- Volume 5, Annex 5-13: Intertidal waterfowl data analysis in relation to onshore works (Document Ref: 6.5.5.13).

1.3.2 It is noted in Advice Note 10 (PINS, 2013) that the EIA and HRA apply differently to decision making, with the ES informing the decision (its findings must be taken into consideration) whereas the Development Consent Order (DCO) can only be made if the decision-maker has followed the stages prescribed by the 2010 Habitats Regulations (see Figure 2.1). Therefore, the information contained in the above chapters and documents has been used to inform the decisions made here in the RIAA, with the RIAA following the prescribed stages.

1.4 Structure of the RIAA

1.4.1 This document is set out in a number of stages that mirror the HRA process, with the overall structure of the document summarised below.

- **Section 1:** Introduction. Providing a background to the project, including the purpose and structure of the project and where additional project related information (including baseline environment and EIA) can be found;
- **Section 2:** Legislation, Policy and Guidance. To identify the legislation driving the need for the report and the policy and guidance providing the structure;
- **Section 0:** Roles and Responsibilities. Identifying key individuals and organisations with a role in the HRA process;
- **Section 4:** Consultation. Summarising the consultation undertaken, with whom, issues raised, how and where these have been addressed. Including the Evidence Plan and need for Transboundary Consultation;
- **Section 5:** Project Overview. Drawing on the information presented in relevant chapters of the ES, providing the maximum adverse scenario for each receptor group including temporal and spatial aspects;
- **Section 6:** Embedded Mitigation. To include project specific mitigation included per receptor group;

- **Section 7:** The Screening Process for the Project Alone. Summarising the screening undertaken, including the approach, conclusion on the potential for LSE and any changes following completion of the Preliminary Environmental Information Report (PEIR), consultation on the PEIR and relevant updates following the ECJ ruling;
- **Section 8:** The Screening Process for the Project In-Combination. Presenting the approach to identifying the plans and projects to consider in-combination;
- **Section 9:** Summary of Designated Sites. Summarising site specific information for all designated sites screened in;
- **Section 10:** Assessment Criteria. Providing the definitions against which the potential for an adverse effect has been determined, on a receptor by receptor basis;
- **Section 11:** Assessment of Adverse Effect Alone. Determination of whether the project alone will result in an adverse effect;
- **Section 12:** Assessment of Adverse Effect In-combination. Determination of whether the project in-combination with other plans and projects will result in an adverse effect;
- **Section 13:** Transboundary Statement;
- **Section 14:** Conclusion of the Assessment. Summarising the conclusions on adverse effect, alone and in-combination; and
- **Section 15:** References.

2 Legislation, policy and guidance

2.1 Legislative Context and Government Policy

- 2.1.1 The Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora, protects habitats and species of European nature conservation importance. Together with the Council Directive (2009/147/EC) on the conservation of wild birds (the 'Birds Directive'), the Habitats Directive establishes a network of internationally important sites, designated for their ecological status. SACs are designated under the Habitats Directive and promote the protection of flora, fauna and habitats. Special Protection Areas (SPAs) are designated under the Birds Directive in order to protect rare, vulnerable and migratory birds. These sites combine to create a Europe-wide 'Natura 2000' network of designated sites, which are hereafter referred to as 'European sites'.
- 2.1.2 Terrestrial areas of the UK, and territorial waters out to 12 nautical miles (nm), are covered under The Conservation of Habitats and Species Regulations 2017 (herein referred to as the Habitats Regulations) which transposes the European legislation into UK legislation. The Habitats Regulations incorporate all SPAs into the definition of 'European sites' and, consequently, the protections afforded to European sites under the Habitats Directive apply to SPAs designated under the Birds Directive.
- 2.1.3 The Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Offshore Habitats Regulations) transpose the Habitats and Birds Directives into national law, covering waters beyond 12 nm, to the extent of the British Fishery Limits and UK Continental Shelf Designated Area.
- 2.1.4 In addition, UK Government policy (ODPM Circular 06/2005) states that internationally important wetlands designated under the Convention on Wetlands 1971, called the Ramsar Convention (Ramsar sites) are afforded the same protection as SPAs and SACs for the purpose of considering development proposals that may affect them. The Government also affords the same level of protection to potential SPAs (pSPAs) and candidate SACs (cSACs) and to sites identified, or required, as compensatory measures for adverse effects on any of the above sites.

- 2.1.5 Under the Habitats Regulations and the Offshore Habitats Regulations, before granting approval (i.e. planning permissions, licences and consents) for a development likely to have a significant effect on an SAC or SPA/ Ramsar site, an appropriate assessment must be made by a Competent Authority of its implications for the site in view of that site's conservation objectives.
- 2.1.6 Of note is a recent ruling by the ECJ, referred to as Sweetman II¹. The ruling relates to how screening for Likely Significant Effect (LSE) is carried out, specifically in relation to the way in which mitigation is considered in the LSE screening process. The ruling was issued shortly before finalisation of the RIAA; however screening for Thanet Extension has been revisited and, where relevant, conclusions on LSE have been revisited. Any changes are highlighted in sections 7 and 8 (screening for the project alone and in combination) and, where relevant, followed through into sections 11 and 12 (determination of potential adverse effect). Guidance has yet to be issued regarding the ruling.

2.2 Guidance Documents

- 2.2.1 A number of guidance documents are available regarding the HRA process and associated topics. Some of these have been issued at European level, others at UK level (or constituent country). Documents are available that provide guidance on the whole HRA process, part of that process, or are relevant to a particular receptor. A summary of the available HRA guidance, as relevant to the current RIAA, is provided below; documents issued by the EC, UK Government (or devolved administrations) or statutory bodies are provided first, with documents issued by other agencies or organisations together with other relevant but not HRA specific guidance listed separately.
- European Commission (2001): Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites;
 - European Commission: EU Guidance on wind energy development in accordance with EU nature directives;
 - European Commission (2000) Managing Natura 2000 Sites - the Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC;
 - European Commission (2001) Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC;

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62017CJ0323>

- Opinion of the Commission (2007) Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC – Clarification of the concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures;
- European Commission (2011) Guidance Document on Wind Energy Developments and Natura 2000;
- Department of Communities and Local Government: Guidance on ‘Planning for the Protection of European Sites: Appropriate Assessment’;
- Planning Inspectorate (PINS) Advice Note 9: Rochdale Envelope;
- PINS Advice Note 10: Habitat Regulations Assessment relevant to nationally significant infrastructure projects;
- Department of Energy and Climate Change: Guidelines on the Assessment of Transboundary Impacts of Energy Developments on Natura 2000 Sites Outside the UK;
- English Nature: Habitats Regulations Guidance Note (HRGN 1): The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994;
- English Nature: Habitats Regulations Guidance Note (HRGN 3): The Determination of LSE under the Conservation (Natural Habitats &c) Regulations, 1994;
- English Nature: Habitats Regulations Guidance Note (HRGN 4): Alone or in combination;
- Natural England and JNCC: Interim advice on HRA screening for seabirds in the non-breeding season;
- Natural England and JNCC: Interim Advice Note – Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation to Offshore Windfarm Developments;
- Literature and discussions held during a series of workshops in 2016 and 2017 in connection with the Southern North Sea cSAC; and
- Guidance on when new marine Natura 2000 sites should be taken into account in offshore renewable energy consents and licences (the Department of Energy and Climate Change (DECC), 2016).

2.2.2 Additional documents of relevance are provided below.

- Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010);
- JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017);
- JNCC guidelines for minimising the risk of injury to marine mammals from using explosives (JNCC, 2010);

- Managing underwater noise in European Waters (Tasker *et al.*, 2010);
- The protection of marine European Protected Species from injury and disturbance. Guidance for the marine area in England and Wales and the UK offshore marine area, (JNCC, NE and CCW 2010);
- Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers (King *et al.* 2009);
- Assessment methodologies for offshore wind farms (Maclean *et al.*, 2009);
- Cumulative Impact Assessment Guidelines – Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (RenewableUK 2013);
- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, freshwater and coastal. (CIEEM, 2016);
- Advice on assessing displacement of birds from offshore wind farms (Statutory Nature Conservation Bodies (SNCBs), 2017);
- Collision risk modelling (CRM) to assess bird collision risks for offshore wind farms (Band, 2012);
- CRM incorporating variability and uncertainty to assess bird collision risks for offshore wind farms (Masden, 2015);
- Assessing the risk of offshore wind farm development to migratory birds (Wright *et al.*, 2012);
- Vulnerability of seabirds to offshore wind farms (Furness and Wade 2012; Furness *et al.*, 2013);
- Seabird sensitivity to offshore wind farms in English Territorial Waters (Bradbury *et al.*, 2014);
- The avoidance rates of collision between birds and offshore turbines (Cook *et al.*, 2014);
- Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review (JNCC *et al.*, 2014); and
- Consideration of quantifying impact assessments for selected seabird populations (MacArthur Green, 2016).

2.3 The HRA Process

- #### 2.3.1
- The Habitats Regulations require that whenever a project that is not directly connected to, or necessary for the management of a Natura 2000 site, is likely to have a significant effect on the conservation objectives of the site (directly, indirectly, alone or in combination with other plans or projects), then an AA must be undertaken by the Competent Authority (Regulation 63 of the Habitats Regulations). The AA must be carried out before consent or authorisation can be given for the project.

2.3.2 PINS Advice Note 10 'Habitat Regulations Assessment relevant to national significant infrastructure projects' (version 7, January 2016), defines HRA as a step by step process which determines LSE and (where appropriate) assesses adverse impacts on the integrity of a European site, examines alternative solutions, and provides justification of IROPI. As noted above in section 2, HRA includes a four stage process, as summarised below and illustrated in Figure 2.1.

- **HRA Stage 1 – Screening:** Screening for LSE (alone or in-combination with other projects or plans);
- **HRA Stage 2 – Appropriate Assessment:** Assessment of implications of identified LSEs on the conservation objectives of a European site to ascertain if the proposal will adversely affect the integrity of a European site;
- **HRA Stage 3 – Assessment of Alternatives:** Where it cannot be ascertained that the proposal will not adversely affect the integrity of a European site, alternative solutions must be considered; and
- **HRA Stage 4 – Assessment of IROPI:** Where no alternatives are identified.

2.3.3 All four stages of the process are referred to as the HRA to clearly distinguish the whole process from the one step within it referred to as the 'AA'. The first stage (Screening), as noted above in section 2, has been completed for Thanet Extension alone and a summary available in section 4 (including updates to that screening where relevant). The full HRA screening is available in Annex 1 of this report (Document Ref: 5.2.1). Screening for the Project in-combination with others is presented here in section 8. Where the screening process concludes the potential for a LSE, then there is a requirement for a focussed and tightly scoped AA (Stage 2). Screening for Thanet Extension has identified the possibility of LSE for certain features and effects. The required AA will be conducted by the SoS, with the information necessary to inform that assessment provided here.

2.3.4 Included within Advice Note 10 is the need for two matrices to be completed; the Screening Matrix and the Integrity Matrix. These have been completed in the required format and are included in Annex 2 (Document Ref: 5.2.2).

2.3.5 The integrity of a site is defined as the coherence of the site's main ecological structure and function across the whole of its area, which enables it to sustain the habitat, complex of habitats and/ or populations of species for which the site has been designated (EC, 2001). An adverse effect on integrity is likely to be one which prevents the site from making the same contribution to favourable conservation status as it did at the time of designation.

2.3.6 PINS Advice Note 10 includes a number of points to be considered under Stage 2 and as such need to be considered in this RIAA. These are defined as follows (including the section where each is considered):

- Evidence about the project's impacts on the integrity of protected sites (consideration of adverse effect alone is presented in section 11);
- A description of any mitigation measures proposed which avoid or reduce each impact, and any residual effect (embedded mitigation measures are set out in section 6, with conclusions on adverse effect summarised in sections 11 and 12);
- A schedule indicating the timing of mitigation measures in relation to the progress of the development (timing of mitigation measures, where relevant, is included in section 6), with conclusions on adverse effect summarised in section 14;
- Cross references to the relevant DCO requirements and development consent obligations that secure these mitigation measures, and identification of any factors that might affect the certainty of their implementation (as highlighted in section 6 on embedded mitigation);
- A statement as to which (if any) residual effects constitute an adverse impact on the integrity of European sites either alone or in combination with other plans or projects and therefore need to be included within the AA (a summary of the conclusions on the potential for an adverse effect alone and in-combination is provided in section 14); and
- Evidence to demonstrate that the applicant has fully consulted and had regard to comments received by the relevant Statutory Nature Conservation Bodies (SNCBs) during pre-application consultation (consultation conducted to date is described in section 4).

2.3.7 Stages 3 and 4, as outlined in within Figure 2.1, are only required where a conclusion of adverse effect is drawn following Stage 2.

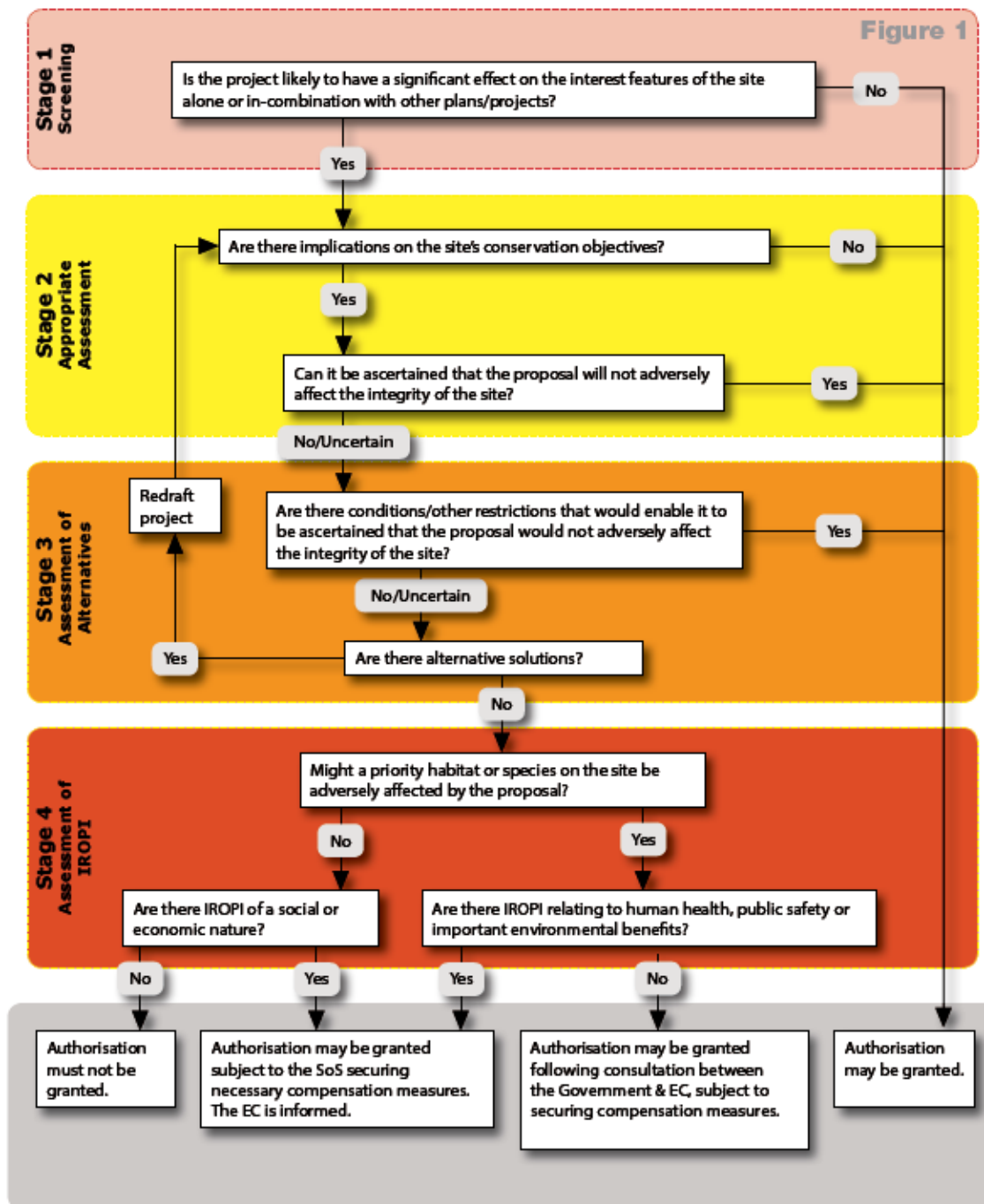


Figure 2.1: HRA stages (from PINS, 2016)

3 Roles and responsibilities

- 3.1.1 The purpose of a RIAA is to provide the information to the Competent Authority required to enable it to undertake the AA, in accordance with Regulation 63 of the Habitats Regulations. The Competent Authority for Thanet Extension is the SoS for BEIS.
- 3.1.2 This RIAA (and any supporting documentation, notably the attached appendices) produced as part of the application for a DCO for Thanet Extension provides the information required by the competent authority to enable it to undertake an appropriate assessment of the implications of the project on the integrity of designated interests of relevant European sites (in accordance with Article 6(3) of the Habitats Directive) and any relevant Ramsar sites (relevant site designations defined in section 2 above).

4 Consultation

4.1.1 Extensive consultation has been ongoing for Thanet Extension, with all consultation undertaken date summarised in the Consultation Report (Document Ref: 5.1). Consultation undertaken specifically with regard to the HRA process (and which is included within the Consultation Report) has been managed through the following:

- Consultation on the Scoping Report (COMPLETE, with consultation relevant to the HRA process summarised and taken into account within the Screening report included in Annex 1);
- Consultation on the draft Screening Report (COMPLETE, with consultation undertaken up to that point and relevant to the HRA process summarised and taken into account within the Screening report);
- Consultation on the final Screening Report (COMPLETE, with all comments received summarised and taken into account within the final RIAA);
- Meetings of the Thanet Extension Evidence Plan (COMPLETE, with all comments received by Monday 21 May 2018 summarised and taken into account within the final RIAA);
- Consultation on the draft RIAA (COMPLETE, with all comments received by Monday 21 May 2018 summarised and taken into account within the final RIAA); and
- Preparation of a Statement of Common Ground (SoCG) (to be undertaken, and submitted during the DCO examination).

4.1.2 It was noted in the Scoping Opinion² (Document Ref: 6.8.1) that the SoS welcomed that an Evidence Plan Process would be undertaken to structure technical stakeholder consultation for HRA matters, with a particular note that the process would be appropriate to agree (where possible) timing and relevance of surveys and the methodologies to be used. The Evidence Plan process has been followed during the drafting of and following the issue of the Screening Report, and has continued through the preparation of the RIAA.

4.1.3 The need for transboundary consultation was also acknowledged in the Scoping Opinion (paragraph 4.44 onwards). PINS Advice Note 10 (PINS, 2016) notes that where an application is 'likely to have a significant effect (either alone or in-combination) on a Natura 2000 site in another Member State, the applicant should obtain and provide all relevant information, as reasonably practicable with their DCO application'. That position is reiterated by DECC in their 2015 guidance on transboundary impacts on Natura 2000. DECC (2015) went on to say that 'the format and extent of transboundary consultation is for the applicant to agree with the Planning Inspectorate'.

4.1.4 The comments received in response to the Scoping Report, specifically in relation to the HRA process, are summarised in Table 3.1 within the HRA Screening Report (Document Ref: 5.2.1), including where and how the comments were addressed. Those comments have therefore not been repeated here.

4.1.5 PINS undertook transboundary screening in July 2017³. The States notified were the Netherlands, Belgium, France, Germany and Denmark. Responses received are available on the PINS website⁴, with a summary of the points relevant to the RIAA included in Table 4.1.

4.1.6 The RIAA provides the information necessary for transboundary consultation on HRA matters initially through the identification of transboundary sites where LSE applies in relation to the project alone in the Screening Report, followed by consideration of LSE in-combination and the determination of adverse effect alone and in-combination made here within the RIAA. That information is provided to inform the AA, to be undertaken by the SoS.

²<https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010084/EN010084-000025-Scoping%20Opinion.pdf>

³<https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010084/EN010084-000078-Regulation%2024%20Transboundary%20Screening%20document%20.pdf>

⁴<https://infrastructure.planninginspectorate.gov.uk/projects/south-east/thanet-extension-offshore-wind-farm/?ipcsection=docs>

4.1.7 The draft Screening Report was issued on 15th June 2017 to Natural England, Royal Society for the Protection of Birds (RSPB), Kent County Council, Kent and Essex Inshore Fisheries and Conservation Authorities (IFCA), the Environment Agency, the Kent Wildlife Trust, Historic England, Marine Management Organisation (MMO), Cefas and Thanet District Council for comment, with the report re-issued on 4th July 2017 to MMO. The initial Evidence Plan meetings were subsequently held on 11th July (onshore) and 12th July (offshore) 2017, including discussion on the draft Screening Report. Written comments were requested by 28th July 2017 and all received by 2nd August 2017. The comments received on the draft Screening Report are summarised within Table 3.1 of the Screening Report, including where and how the comments have been addressed. Those comments were incorporated within the final Screening Report (Annex 1; Document Ref: 5.2.1) and have not been repeated here.

4.1.8 The revised Screening Report was issued to the Environment Agency, MMO, Natural England, RSPB, Cefas and Kent Wildlife Trust on 27th September 2017, with a further Evidence Plan meeting held on 2nd October 2017 to discuss HRA matters (including screening). A summary of the consultation responses received in response to the revised Screening report, including that discussed at the Evidence Plan meeting on 2nd October 2017, are provided in Table 4.1 including where those comments have been addressed here.

4.1.9 In addition, statutory consultation was conducted on the Preliminary Environmental Information Report (PEIR) between 27th November 2017 and 12th January 2018, with this reported on in full in the Consultation Report (Document Ref: 5.1). The majority of comments received were in relation to the PEIR (as that was the document available for comment), with a limited number specifically referencing the RIAA or wider HRA process. Where comments were received that apply specifically to the RIAA, these have been reviewed and included here in Table 4.1, including how and where these comments have been addressed within the RIAA. Comments aimed at the PEI more widely have been incorporated into the ES, on which the RIAA draws, and have therefore been taken into account during the preparation of the RIAA where relevant. These comments are therefore not repeated here but are summarised within the following documents (including reference to where and how each comment has been addressed):

- Comments made in relation to subtidal and intertidal benthic ecology are summarised in Table 5.5 of Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Comments made in relation to marine mammals are summarised in Table 7.2 of Volume 2, Chapter 7: Marine Mammal (Document Ref: 6.2.7);
- Comments that might relate to diadromous fish are summarised in Table 6.3 of Volume 2, Chapter 6: Fish and Shellfish Ecology (Document Ref: 6.2.6);
- Comments made in relation to offshore ornithology are summarised in Table 4.2 of Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4); and

- Comments made in relation to onshore biodiversity are summarised in Table 5.2 of Volume 3, Chapter 5: Biodiversity (Document Ref: 6.3.5).

4.1.10 PINS Advice Note 10 recommends that agreement is sought via a SoCG with respect to the HRA process with relevant organisations, in particular the SNCBs. A SoCG will be submitted during examination (and therefore after application for a DCO). In the interests of facilitating agreements on HRA aspects, VWPL have consulted on the RIAA with the Evidence Plan HRA panel. Comments received have been addressed within this document, as noted in Table 4.1. The SoCG should clearly identify the extent to which relevant matters are agreed, and areas where disputes remain. Following the drafting of the RIAA, and continuing after application, consultation will be ongoing, with the intention being to agree a SoCG with relevant authorities. Specifically, it is the intention of VWPL to undertake a SoCG with Natural England, MMO and Cefas. RSPB and Kent Wildlife Trust will be invited to participate.

Table 4.1: Summary of consultation relating to the HRA process subsequent to the issue of the Revised Screening Report

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
30/08/2017 Email reply to PINS from Ministère de la transition écologique et solidaire	Under the Birds Directive (Wintering and Breeding Birds): ZPS Cap Gris Nez FR3110085 and ZPS Bancs des Flandres FR3112006.	<p>Note that onshore features are screened out due to the distances involved, with screening limited to species that occur offshore only.</p> <p>These two sites identified through the transboundary consultation were not included in the earlier HRA Screening Report. They have now been screened for LSE (section 13).</p>
	Under the Habitats directive (harbour porpoises, grey seals and harbour seal): ZSC Bancs des Flandres FR3102002, ZSC Ridens et dunes hydrauliques FR3102004 and ZSC Récifs et Caps Gris Nez Blanc Nez FR3102003.	<p>Marine mammals assessment alone (section 11.3) and in-combination (section 12.3) includes the following sites as relevant:</p> <ul style="list-style-type: none"> • Bancs de Flandres (harbour porpoise, harbour seal and grey seal); • Ridens et dunes hydrauliques (species screened in are harbour seal and grey seal, screened out based on screening distance is harbour porpoise, as the site is 30 km from the OECC and 50 km from the array); and • Récifs et Caps Gris Nez (screened out for harbour porpoise due to range (minimum distance of 43 km from the array – Table 7.6 of the Screening Report (Document Ref: 5.2.1), screened in for harbour seal and grey seal only).
Offshore Ornithology Meeting minutes (04/10/2017)	The assessment, dependent on the date of submission, might be based on less than 24 months of project specific offshore survey.	The assessment is based on the three months of boat based survey data and 24 months of aerial survey data (presented in the Baseline Technical Report – Volume 4, Annex 4-1 (Document Ref: 6.4.4.1).
	Collision Risk Modelling (CRM) would be based on the Band method but its implementation (in a MicroSoft (MS)Excel or R-software package) would depend on the advice received from the SNCBs on the outputs of the reviews of the R-software package that they had commissioned.	CRM (section 11.4) is based on the Band method implemented in MSEXcel. The R-software package (Masden, 2015) was tested at an earlier stage and found to have issues. The cessation of its use was discussed and agreed with Natural England and RSPB. For further information on the CRM modelling see Volume 4, Annex 4-2: Collision Risk Modelling (Document Ref: 6.4.4.2).
	The in-combination assessment of collision risk would build on the most recent set of predictions agreed by Natural England – that for East Anglia THREE.	The in-combination assessment of collision risk (section 11.4) does build on the collision predictions agreed by Natural England during the East Anglia THREE application process.
	Assessing disturbance and displacement – Natural England sought that the latest guidance from the SNCBs (2017) was followed.	The latest guidance from the SNCBs informs the assessment of disturbance and displacement (section 2).

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	The screening distance for potential disturbance of red-throated diver – Natural England and VWPL sought a distance based on different sources of evidence to be used.	The screening distance applied in the HRA Screening Report is that derived from a study of the construction phase of the London Array Offshore Wind Farm (OWF) (APEM, 2016).
	The in-combination assessment of red-throated diver disturbance and displacement was at risk of an unbalanced approach if data was drawn from past ESs without any revision to account for up-to-date knowledge.	The approach to the in-combination assessment of red-throated diver disturbance and displacement (section 12) has been altered. It is now based on an approach that applies the SeaMaST density data and as-built or proposed wind farm boundaries. This avoids the problems identified with collating figures from past ESs. This revised approach was discussed and agreed with RSPB and Natural England.
HRA Evidence Plan meeting (02/10/2017)	The revision in the project RLB was discussed, including the small area of subtidal for which no survey data is held (outside a designated site). Discussed and agreed with Natural England as not representing a risk to designated sites or EPS.	Noted.
	The permanent loss of a small area of saltmarsh was highlighted. Located within the Sandwich Bay SAC (not a designated feature) and Thanet Coast and Sandwich Bay SPA.	The project design has since been amended and the area of saltmarsh that may be permanently lost has been reduced (Table 5.2). This is assessed as regards its function within the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar as part of the revised screening in section 7. Relevance to the Sandwich Bay SAC is highlighted in section 7.
	Confirmed and agreed with Natural England that the RIAA will not repeat Screening in full, but would instead provide a summary (including any changes to screening) and append the Screening Report for reference.	Screening summarised in section 7, including changes to screening following issue of the Screening Report. The full Screening Report included as Annex 1 (Document Ref: 5.2.1).
	Discussion was held on the screening distance for red-throated diver. VWPL proposed to apply a screening distance of 6.5 km, being applied purely as a screening range to determine the site(s) to be included for assessment - the range is not equivalent to LSE or AEoI. The value was derived from data at London Array and represents the distance at which a statistically significant level of displacement was found. Natural England noted that evidence exists at other, more distant, OWFs for a range greater than 6.5 km.	Screening carried out using 6.5 km. A footnote is appended to Table 7.3 in the HRA Screening Report.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Clarification added that the assessment of AEoI would first provide an assessment of that affect, with the assessment based on conservation objectives (where available), the nature of the effect, existing project literature (including ES conclusions on significance) and project mitigation.</p> <p>In terms of transboundary sites screened in, no conservation objectives are available and it was agreed with Natural England to apply the SNS cSAC conservation objectives to assessment on harbour porpoise and the standard definition of Favourable Conservation Status (FCS) for assessment of harbour seal and grey seal.</p>	<p>Methodology for AEoI alone presented in section 11, for in-combination in section 12.</p> <p>Relevant aspects of transboundary sites (including harbour porpoise conservation objectives and standard FCS definition) provided in section 13.</p>
	<p>Confirmed that the in-combination assessment will be based on those plans and projects identified within relevant ES chapters, with these screened based on the maximum relevant screening distance. Determination of LSE in-combination to take account of available information, effect-pathway-receptor issues and potential for a physical/ temporal interaction. Tiering will be applied. Natural England agreed the presented approach seemed reasonable.</p>	<p>Methodology for AEoI in-combination in section 12.</p>
	<p>The assessment for harbour porpoise will draw on the consideration of Permanent Threshold Shift (PTS) in the ES for consideration of viability. Information on Temporary Threshold Shift (TTS) is provided within the ES (Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7)).</p> <p>In terms of disturbance, an Effective Deterrent Radius (EDR) of 26 km will be applied for piling and Unexploded Ordnance (UXO) clearance, with 5 – 10 km applied for seismic survey (10 km for air gun only).</p> <p>Natural England agreed with the parameters.</p>	<p>Definition of viability and disturbance for harbour porpoise presented in section 9.</p>
	<p>Embedded mitigation will remove direct LSE from the bird features of the SPA/ Ramsar, with intertidal mitigation during construction to follow that applied to Nemo (i.e. seasonal restriction between October and March). Work hours discussed at the time related to 7am to 7pm working (7 days a week) in broad working areas, with a request for 24 hour working at landfall for cable pulling. If Option 1 cable route is selected, a short discrete event may be required to cross the TOWF cable within Sandwich road. Other discrete events may be required for 24 hour working during commissioning or concrete laying as exceptional events – would involve staff present with hand tools and not heavy plant.</p> <p>Further work is required to determine issues around habitats of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar.</p>	<p>The project design has since been amended and a revised list of possible exceptions to 7am to 7pm working is provided (sections 5 and 6).</p> <p>Note that changes have been made to the cable route options following consultation (sections 5 and 6).</p> <p>Embedded mitigation is detailed in Table 6.1.</p> <p>Updates to Screening are presented in section 7.</p> <p>The potential for AEoI for the intertidal habitats of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar is assessed and presented in section 11 (alone) and section 12 (in-combination).</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Natural England requested information on the efficacy of saltmarsh recovery and mitigation from previous cables in the local area. GoBe confirmed that there was rapid recovery (2010-2012) of saltmarsh for TOWF, with the saltmarsh habitat relevant to Thanet Extension being similar to that found at the TOWF landfall. The landfall for Thanet Extension has been selected partly due to the existing narrowing in the saltmarsh habitat, to minimise interaction with the saltmarsh. Horizontal Directional Drilling (HDD) under the saltmarsh is considered high risk and if it failed would require lengthy trenching through primary saltmarsh.</p>	<p>Noted. HDD under the saltmarsh is now included as a potential option, although its feasibility can only be confirmed following Site Investigation works, which have yet to be completed (section 5).</p>
	<p>UXO clearance will be included within the RIAA.</p>	<p>UXO clearance included for the assessment on AEoI alone in section 11 (alone) and section 12 (in-combination).</p>
	<p>RSPB confirmed they had no further comment on the HRA and agreed on the proposed in-combination approach.</p>	<p>Noted.</p>
<p>Letter from Natural England (by email) dated 26/10/2017</p>	<p>A full appraisal of why the southern landfall route has been dropped is required, including quantitative reasoning and evidence.</p>	<p>Volume 1, Chapter 4: Site Selection and Alternatives (Document Ref: 6.1.4). A summary is provided in section 5.</p>
	<p>The landfall will result in a permanent loss of saltmarsh, which falls within the Sandwich Bay SAC, Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar. Natural England is concerned about the amount of saltmarsh being lost and the associated cumulative impacts during and after construction. Any permanent loss needs to be clearly put in the context of the designated sites, with the potential area to be lost stated in m²/ km², with associated figures illustrating the potential loss provided. The potential construction footprint must be provided to determine how far reaching disturbance will be. The evidence for why there has to be a loss of designated saltmarsh and if any alternatives were considered needs to be presented.</p>	<p>The project design has since been amended and the area of saltmarsh that may be permanently lost has been reduced (section 5). Updates to screening, including screening of the importance of the saltmarsh which may be lost for qualifying features of Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar and Sandwich Bay SAC are discussed in section 7. Further detail on the habitat loss is provided in Volume 2 Chapter 5: Benthic Subtidal and Intertidal Ecology. Evidence for the need for the landfall option and alternative considered is presented in section 5.</p>
	<p>The extension of the seawall has the potential to act as a barrier to the natural accretion and erosion of saltmarsh in the area, which could encourage erosion or accretion. Further information on coastal geomorphology in the area is required.</p>	<p>Volume 2 Chapter 2: Marine Geology, Oceanography and Physical Processes considers all relevant landfall option aspects (the realignment of the existing sea defences, cofferdam, HDD and trenching) with respect to designated coastal features. The assessment found the potential for a change in marine physical processes to be very small, concluding these to be of minor significance. Consideration of a change in physical processes is made in Section 7 (screening for LSE), and followed into Section 11 (Thanet Extension alone) where relevant.</p>
	<p>Further consideration is required for indirect effects caused by displacement of recreational pressure from the country park to other areas</p>	<p>The issue has been screened in for potential LSE (section 7) and therefore assessed for potential adverse effects on qualifying bird species for the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar in section 11 (Thanet Extension alone) and section 12 (in-combination).</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	Feasibility of applying the SeaMAST mapping tool to assess the cumulative EIA for red-throated diver.	The approach has been used of applying the SeaMaST data set in the cumulative / in-combination assessment of red-throated diver disturbance and displacement.
Response by Natural England under Section 42 (by email) dated 12/01/2018	Key concern is the proposed permanent loss of saltmarsh at the landfall, with respect to the Thanet Coast and Sandwich Bay SPA. The proposals are a permanent loss (of up to 1,399 m ²) and there is no assessment of potential impacts to changes in physical processes (such as erosion and accretion), potential for leachate contamination from the landfill or functional loss of habitat for SPA birds. There is a lack of information about alternative cable routes and/ or installation methodologies discounted. It is anticipated that further information regarding extensive mitigation, offsetting habitat losses and biodiversity enhancement options will follow, once a landfall option has been agreed.	<p>The permanent loss of habitat at the landfall has been reduced compared to that presented in the PEIR. Further justification for the need for this and the associated impacts have been fully assessed within the relevant chapters. It is noted that the works will not result in any separation of the saltmarsh due to the reduced extent of the seawall works.</p> <p>The alternative cable routes and installation methods considered and discounted are detailed within the relevant ES chapter (Volume 1 Chapter 4: Site Selection and Alternatives), with reference made to relevant aspects here in Section 5.3. Three options remain for landfall.</p> <p>The impacts from the permanent loss of saltmarsh at the landfall have been assessed in the relevant ES chapters and are considered here for potential LSE through the revised screening in section 7. Embedded mitigation is provided for in Table 6.1 and the relevant plans listed in section 7.</p>
	The Outer Thames Estuary Extension SPA has now been designated and treated as a whole site.	Text throughout has been updated to reflect the change, with the assessment made on that basis (see section 11 and 12).
	Consideration of the Habitats Regulations should not be excluded from the PEIR and eventual ES.	Full consideration of the Habitats Regulations provided within the RIAA, with the Habitats Regulations referred to within the ES as relevant.
	Concerned about disturbance by construction vehicles on protected sites and species within the vicinity of the landfall.	Impacts resulting from construction disturbance to qualifying features for the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar and their supporting habitats are considered in the revised screening in section 7 and, where relevant, in section 11 (Thanet Extension alone) and section 12 (in-combination).
	The potential cumulative and disturbance effects the replacement of the existing Thanet cable will potentially cause.	The Thanet Cable Replacement project is no longer being pursued and as such an in-combination impact assessment is not required.
	Natural England would like to see use of HDD being revisited and discussions around mitigation and further landfall options, whether further north or south and both within and outside of Pegwell Bay, to continue. Welcome further site investigation works.	HDD under the saltmarsh is now included as a potential option, although its feasibility can only be confirmed following Site Investigation works, which have yet to be completed (section 5).
	Natural England disagrees with the assumption that no red-throated divers are displaced from the 4 km buffer to the proposed extension. We advise that the assessment should be based on an assumption of 100 % displacement occurring out to 4 km, as per the 2017 joint SNCB advice note on assessing disturbance.	The assessment of displacement has been carried out using the local site based evidence of no displacement from outside of the proposed Thanet Extension. Supplementary information has been provided to identify what is the population in the 4 km buffer to allow Natural England to draw their conclusions if they judge that appropriate (section 11).

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	Natural England deem it inappropriate to assess the cumulative impacts on red throated diver by taking figures from environmental statements, and instead data should be taken from a single source such as JNCC designation data.	The approach of using a single source has been adopted and the SeaMaST data set has been applied in the cumulative/ in-combination assessment of red-throated diver disturbance and displacement (section 12).
	The assessment of displacement mortality for each season is presented separately without consideration of impacts on populations across the whole annual cycle. Natural England advise that displacement impacts calculated for individual seasons should be summed across seasons to allow assessment of the annual impact on the population.	Information on individual seasons and the sum across the seasons has been applied in the assessment (section 11).
	The use of the Masden model for collision risk modelling, it is still currently undergoing testing and we advise that the Band (2012) model is used and that the outputs are presented to account for variability in the input parameters (especially densities of birds in flight, flight heights and avoidance rates).	CRM is based on the Band method implemented in MSEXcel (section 11).
	From Thursday 30 November 2017, the Conservation of Habitats and Species Regulations 2010 and the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 were consolidated and replaced with the Conservation of Habitats and Species Regulations 2017 (or 'the Habitats Regulations 2017') and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (or the 'Offshore Habitats regulations 2017').	Text amended throughout
	Based on the Marine water and sediment quality chapter, Natural England agrees that no LSE can be concluded for the topics of Marine Water and Sediment Quality.	Noted
	Requested greater consideration to the possible effects of visitor displacement to more sensitive areas of the coast and how any effects can be mitigated, particularly around busy periods of the year such as national holidays.	The issue has been screened in for potential LSE (section 7) and therefore assessed for potential adverse effects on qualifying bird species for the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar in section 11 (Thanet Extension alone) and section 12 (in-combination).
	Requested further information regarding the habitat requirements of Ramsar wetland invert assemblage species in order to determine how likely they are to be affected. Also requested further details of relevant mitigation measures.	Updates to screening, including screening of the potential for LSE in respect of the Thanet Coast and Sandwich Bay Ramsar wetland invertebrate assemblage, are discussed in section 7. Embedded mitigation measures are set out in Table 6.1. Assessment of adverse effects is provided in section 11 (Thanet Extension alone) and section 12 (in-combination).

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Construction impacts on European golden plover (non-breeding) – the desk study showed no evidence of farmland use within the RLB and none recorded during bird surveys. Therefore, the only issue is birds using the saltmarsh and other inter-tidal areas. Primary embedded mitigation measure to address most construction impacts is timing of all inter-tidal and shoreline works to avoid the key months of Oct-March, which has been accepted as appropriate mitigation for other similar schemes. Construction Environment Management Plan (CEMP) is considered to address any air and water pollution issues. Overall conclusion is that adverse effects from construction would not be significant. NE agree this conclusion is accurate, although requested further information within a draft CEMP.</p>	<p>Noted.</p> <p>Timing restrictions would apply to construction works in the inter-tidal and at the landfall (see Table 6.1).</p> <p>Updates to screening of the potential for LSE in respect of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar, are discussed in section 7. The potential for AEoI is assessed and presented in section 11 (alone) and section 12 (in-combination).</p> <p>A Code of Construction Practice (CoCP), which includes a section setting out the principles upon which a detailed CEMP will be based, is provided with the application (Document Ref: 8.1). A detailed CEMP will be provided in accordance with the CoCP pre-commencement.</p>
	<p>Construction impacts on ruddy turnstone (non-breeding) – the peak count from winter surveys was 0.9% of the SPA population. The majority of the population was found in northern areas of the SPA towards Whitstable. The low numbers displayed and the species general tolerance of disturbance and artificial habitats is stated. CEMP to address pollution issues. Overall conclusion is that adverse impacts from construction would not be significant. The embedded mitigation for European golden plover regarding the timing of works will also benefit ruddy turnstone.</p>	<p>Noted.</p> <p>As above, a CoCP, which includes a section setting out the principles upon which a detailed CEMP will be based, is provided with the application (Document Ref: 8.1). A detailed CEMP will be provided in accordance with the CoCP pre-commencement.</p>
	<p>Welcomed the intention to continue the timing of any inter-tidal or shoreline O&M works to avoid key over-wintering bird period of Oct-March.</p>	<p>Timing restrictions would apply to construction works in the intertidal and at the landfall (see Table 6.1).</p> <p>Updates to screening of the potential for LSE in respect of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar, are discussed in section 7. The potential for AEoI is assessed and presented in section 11 (alone) and section 12 (in-combination).</p>
<p>Response by MMO under Section 42 (by email) dated 11/01/2018</p>	<p>The PEIR refers to mitigation which is to be secured through reports (e.g. Marine Pollution Contingency Plan, Marine Mammal Mitigation Plan). When the DCO and embedded DML is drafted, any such reports which require approval must be secured via conditions within the DML.</p>	<p>Embedded mitigation, including the route for securing the mitigation, is presented in Table 6.1.</p>
	<p>The met mast, which is included in the overall Project Description, needs to be assessed in all relevant chapters.</p>	<p>Project description for each topic has been drawn from the relevant ES chapter and includes the met mast as appropriate.</p>
	<p>The Thanet cable replacement needs to be included in the in-combination assessment.</p>	<p>The Thanet Cable Replacement project is no longer being pursued and as such an in-combination impact assessment is not required.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	UXO removal or detonation (if required) has licensing requirements and Rochdale Envelope applies.	UXO removal or detonation is included (where relevant) in the assessment alone (section 11) and in-combination (section 12), with a worst-case scenario assumed (in terms of anticipated number, type, location of UXO).
	Assessment of the cofferdam will be included within the final application.	The impacts from the use of a cofferdam during works to the seawall have been assessed in the relevant ES chapters and is included here as regards temporary disturbance during construction in relation to relevant designated site features.
Response by Kent Wildlife Trust under Section 42 dated 12/01/2018	Queried the cable route selection suggesting that a “favoured route” had already been selected by Vattenfall prior to consultation. KWT believe the proposed cable route is potentially a highly environmentally-damaging choice, likely to cause significant harm to an internationally and nationally designated site and strongly object to the proposal.	The consideration of alternatives is discussed in section 5.3.
	Expressed concerns regarding cumulative impacts and highlighted the potential for cumulative impacts in relation to the repair of cables for the existing Thanet Offshore Wind Farm.	The assessment of adverse effects in-combination is provided in section 12. The Thanet Cable Replacement project is no longer being pursued and as such an in-combination impact assessment is not required.
	It is important that a site based approach is taken to the Southern North Sea cSAC HRA assessment. The Wildlife Trusts do not support the existing threshold based approach to assessment. More monitoring of harbour porpoise is required in relation to the cSAC, including pre, during and post construction monitoring of noise levels. In addition, a programme of harbour porpoise monitoring is required, again pre, during and post construction, to understand harbour porpoise distribution and the impacts of wind farm development on this.	The assessment of the SNS cSAC follows current SNCB guidance and best practice advice.
	UXO noise impacts need to be included.	UXO is included within the assessment for marine mammals alone (section 11) and in-combination (section 12).
	The marine mammal cumulative assessment needs to include all activities, including UXO clearance, geophysical surveys, aggregate extraction and dredging, navigation and shipping (presence/numbers and collision risk), commercial fishing, cables and pipelines and coastal developments.	The in-combination assessment for marine mammals includes all relevant plans and projects screened in, and follows the precedent set by previous such assessments (including the recent BEIS AA for East Anglia ONE ⁵).

⁵<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010025/EN010025-002920-East%20Anglia%20ONE%20Requirement%2036%20-%20Record%20of%20Appropriate%20Assessment%20of%2017%20.pdf>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Response by Environment Agency under Section 42 dated 12/01/2018	Permanent loss of habitat at landfall. Objection to the loss and suitable alternatives have not been considered sufficiently.	<p>The permanent loss of habitat at the landfall has been reduced compared to that presented in the PEIR. Further justification for the need for this and the associated impacts have been fully assessed within the relevant chapters. It is noted that the works will not result in any separation of the saltmarsh due to the reduced extent of the seawall works.</p> <p>The impacts from the permanent loss of saltmarsh at the landfall have been assessed in the relevant ES chapters and are considered here for potential LSE through the revised screening in section 7.</p> <p>Embedded mitigation is provided for in Table 6.1 and the relevant plans listed in section 7.</p>
Section 42 Consultation Response to PEIR from RSPB dated 12/01/18	Collection of a full 24 months of baseline data is needed for the assessment. We strongly recommend the use of 24 months of data to capture environmental and seasonal variability.	The assessment is based on the three months of boat based survey data and 24 months of aerial survey data (presented in the Baseline Technical Report – Volume 4, Document Ref. 6.4.4.1).
	Both for construction and operational impacts for red-throated diver, we do not agree that the spatial extent of the displacement assessment should be limited to the presentation of impacts on birds within the extension footprint and both should include a 4km buffer. We maintain that a precautionary approach would be to assume all birds within the 4km were potentially affected during both construction and operation.	The assessment of displacement has been carried out using the local site based evidence of no displacement from outside of the proposed Thanet Extension. Supplementary information has been provided to identify what is the population in the 4 km buffer to allow the RSPB to draw their conclusions if they judge that appropriate (section 11).
	Whilst there is uncertainty around the validity of the outputs of the R-based stochastic CRM (“Masden” model) then the previous spread-sheet based Band model should be reverted to, whilst still incorporating some uncertainty.	CRM is based on the Band method implemented in spreadsheets run in MSEXcel (section 11).
	We accept that cumulative / in-combination assessment is problematic as are the multiple issues surrounding the use of ‘historical’ data. To circumvent these issues, we suggest the use of a ‘common’ underlying dataset of diver abundance, which covers the region of interest; to which the same impact (100% displacement over 4km buffers) could be applied to all sites of interest. This, for example, could use the SeaMaSTs data set and previously discussed during consultation meetings.	The approach of using a single source has been adopted and the SeaMaST data set has been applied in the cumulative / in-combination assessment of red-throated diver disturbance and displacement (section 12).
	Requested further detail on the amount and location of intertidal habitat, potentially used by SPA designated species such as European golden plover and ruddy turnstone, to be permanently lost. Also requested details of mitigation measures proposed for permanent loss of designated and functionally linked habitat.	Updates to screening, including screening of the importance of the saltmarsh which may be lost for qualifying features of Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar and Sandwich Bay SAC are discussed in section 7.
	Requested further information regarding usage of inland non-intertidal habitat by European golden plover, noting that usage may vary between daytime and night time.	Updates to screening, including screening of the potential for LSE in respect of inland non-intertidal habitat used by European golden plover, are discussed in section 7.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	Noted that little tern was identified as a designated species of the SPA. It is acknowledged that the species is not currently breeding at the SPA but requested guarantees that none of the work will have an impact on the historical breeding site that would prevent the species from recolonising in the future.	Updates to screening, including screening of the potential for LSE in respect of breeding little tern, are discussed in section 7.
Ministere de la Transition Ecologique et Solidaire dated 12/01/2018	<p>Thanet Extension could impact some species and habitats listed under the Habitats and Birds Directives, as follows:</p> <ul style="list-style-type: none"> • Bancs de Flandres (grey seal and harbour porpoise); • Ridens et dunes hydrauliques (grey seal, harbour seal and harbour porpoise); • Recifs Gris Nez Blanc Nez (grey seal, harbour seal, harbour porpoise); • Bancs des Flandres (lesser black-backed gull, great black-backed gull, northern gannet and black-legged kittiwake); • Cap Griz Nez (northern gannet, black-legged kittiwake, razorbill, red throated diver, lesser black-backed gull, great black-backed gull, herring gull and guillemot); • Littoral seino-marin (northern gannet, black-legged kittiwake, razorbill, red throated diver, lesser black-backed gull, great black-backed gull, herring gull and guillemot) and • Estuaire de la Canche (red throated diver). 	<p>Sites for marine mammals included through screening in section 7.</p> <p>Bird interest features:</p> <p>Bancs des Flandres SPA was included in the additional screening process (Section 7)</p> <p>Cap Griz Nez SPA was included in the additional screening process (Section 7)</p> <p>Littoral Seino-marin SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~160 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p> <p>Estuaire de la Canche SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~100 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p>
	In-combination to include French offshore wind farm projects at Fecamp, Courseulles s/Mer and Dieppe-Le Treport.	Included within the in-combination screening assessment in section 8.
Agence Francaise pour la Biodiversite (Technical Report) dated 12/01/2018	<p>Focus is on the marine mobile species, such as sea birds and marine mammals, as qualifying features within French Natura 2000 sites.</p> <p>Questioned how effects are considered significant and assessed</p> <p>Recommended screening in qualifying mobile species that may interact with potential effects associated with Thanet Extension.</p>	<p>Noted</p> <p>The relevant topic chapters within the ES define significance for each topic, with the method followed within the RIAA for determining potential adverse effect defined within sections 11 (alone) and 12 (in-combination).</p> <p>The screening ranges applied (see section 7 and the original Screening Report in Annex 1 (Document Ref: 5.2.1) take account of the spatial extent of relevant effects.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>The main effect is underwater noise associated with piling – the Bancs des Flandres site (harbour porpoise and grey seal) requires consideration. Other sites that may be affected (harbour porpoise, harbour seal and grey seal) are the Recifs Gris Nez Blanc Nez and Ridens et Dunes hydrauliques</p>	<p>All these designated sites are included for screening in section 7.</p>
	<p>Plans that should be considered in-combination for underwater noise are the Dieppe-Le Treport OWF and the Dunkirk OWF</p>	<p>Proposals added to the in-combination screening process in section 8.</p>
	<p>Nesting seabirds and their foraging areas that could overlap Thanet Extension require consideration. As regards collision risk, potential LSE could be identified for the Bancs des Flandres (northern gannet, kittiwake, lesser black-backed gull and great black-backed gull), Cap Gris Nez (northern gannet and kittiwake) and Littoral Seino-marin (northern gannet, kittiwake, razorbill, guillemot, lesser black-backed gull, herring gull and great black-backed gull. There is a particular concern for lesser black backed gull and great black backed gull from Bancs des Flandres and kittiwake in Cap Gris Nez as their foraging ranges overlap the array.</p>	<p>Bancs des Flandres SPA and Cap Griz Nez SPA were included in the additional screening process and screened out for the reasons given in Section 7.</p> <p>Littoral Seino-marin SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~160 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p>
	<p>Plans that should be considered in-combination for collision risk are the Calvados OWF, Fecamp OWF (both permitted but not yet implemented), Dieppe-Le Treport OWF (submitted but not yet permitted) and the Dunkirk OWF (not yet attributed)</p>	<p>As above, where not previously included for incombination sceening, proposals have been added for consideration in section 8.</p>
	<p>It is recommended that the barrier effect for birds is considered for lesser black backed gull and great black backed gull at the Bancs des Flandres and kittiwake at Cap Gris Nez during the breeding season (although birds are less sensitive to barrier than collision).</p>	<p>Bancs des Flandres SPA and Cap Griz Nez SPA were included in the additional screening process and screened out for the reasons given in Section 7.</p>
	<p>Disturbance and displacement is more significant during operation and maintenance. Most sensitive species are Bancs des Flandres (razorbill, guillemot, red throated diver), Cap Gris Nez (red throated diver, razorbill and guillemot), Estuarire de la Canche (red throated diver) and Littoral Seino-marin (red throated diver, razorbill and guillemot). The barrier effect must be considered as a significant effect for red throated diver.</p>	<p>Bancs des Flandres SPA was included in the additional screening process (Section 7)</p> <p>Cap Griz Nez SPA was included in the additional screening process (Section 7)</p> <p>Littoral Seino-marin SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~160 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p> <p>Estuaire de la Canche SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~100 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	Regarding the cumulative effect of disturbance, displacement and barrier effect, the assessment needs to take account of the Calvados, Fecamp, Dieppe-Le Treport and Dunkirk OWFs during migration.	As above, where not previously included for in-combination screening, proposals have been added for consideration in section 8.
	Areas of ecological functional importance require consideration for seabirds, marine mammals, fish and shellfish.	The assessment includes consideration of the conservation objectives for the designated sites when considering the potential for an adverse effect. Broader issues around ecological importance are addressed within the ES.
	There is a general recommendation for sharing information between UK and French projects.	Noted. The in-combination assessment draws on publicly available information.
	Uncertainty regarding the screening ranges applied – particularly 55km for diadromous fish and 26km for marine mammals – greater explanation required.	The screening ranges applied (see Table 7.3 in the original Screening Report in Annex 1 (Document Ref: 5.2.1)) take account of the spatial extent of relevant effects.
	The Alderney west coast and Burhou Islands Ramsar includes northern gannet and requires consideration.	The Alderney West Coast and Burhou Islands Ramsar site and its breeding interest feature gannet was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as gannet were only recorded in very small numbers in the surveys conducted during the breeding season and the Ramsar site is at a greater distance from Thanet Extension (~340 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.
Agence Francaise pour la Biodiversite dated 12/01/2018	<p>The main significant effect during construction for qualifying mobile species is underwater noise from piling, which could affect marine mammals at distance including at:</p> <ul style="list-style-type: none"> • Bancs des Flandres SAC (harbour porpoise concentration in the winter, some haul out sites for grey seal, together with foraging range of harbour seal, grey seal and harbour porpoise); • Recifs Gris Nez Blanc Nez SAC (foraging range of harbour seal, grey seal and harbour porpoise); • Ridens et dunes hydrauliques (foraging range of harbour seal, grey seal and harbour porpoise). 	All these designated sites have been considered through screening in section 7, with underwater noise considered for LSE.
	<p>Nesting seabirds</p> <p>Bancs des Flandres SPA and the breeding interest features lesser black-backed gull and great black-backed gull</p> <p>Cap Griz Nez SPA and the breeding interest feature kittiwake</p>	Bancs des Flandres SPA and Cap Griz Nez SPA were included in the additional screening process and screened out for the reasons given in Section 7.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Wintering/migrating birds</p> <p>Bancs des Flandres SPA and the wintering/migrating interest features red-throated diver, razorbill and guillemot</p> <p>Cap Griz Nez SPA and the wintering/migrating interest features red-throated diver, razorbill and guillemot</p> <p>Littoral Seino-marin SPA and the wintering/migrating interest features red-throated diver, razorbill and guillemot</p> <p>Estuaire de la Canche SPA and the wintering/migrating interest feature red-throated diver</p>	<p>Bancs des Flandres SPA was included in the additional screening process and screened out for the reasons given in Section 7.</p> <p>Cap Griz Nez SPA was included in the additional screening process and screened out for the reasons given in Section 7.</p> <p>Littoral Seino-marin SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~160 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p> <p>Estuaire de la Canche SPA was considered in the early scoping phase of the LSE screening process and the additional screening process (Section 7) but as it is at a greater distance from Thanet Extension (~100 km) than either Bancs des Flandres SPA or Cap Griz Nez SPA, it was excluded from the scope of screening.</p>
	In-combination assessment of underwater noise to include French offshore wind farm projects at Dieppe-Le Treport and eventually Dunkirk.	As above, where not previously included for incombination scening, proposals have been added for consideration in section 8.
	In-combination assessment of offshore birds at Fecamp, Calvados, Dieppe-Le Treport and eventually Dunkirk.	As above, where not previously included for incombination scening, proposals have been added for consideration in section 8.
Email from Natural England dated 26 th February 2018	<p>Ramsar Invertebrate Assemblage – Natural England confirmed that the wetland invertebrate assemblage qualifying feature for the Thanet Coast and Sandwich Bay Ramsar Site refers to the 14 species listed in Section 22 (page 6) of the Ramsar Information Sheet.</p> <p>Displacement of recreational users from Pegwell Bay Country Park – Natural England confirmed that their main concern is that people will be displaced from the Country Park onto the inter-tidal areas of Pegwell Bay itself, north of the river Stour in particular.</p>	<p>Updates to screening, including screening of the potential for LSE in respect of the Thanet Coast and Sandwich Bay Ramsar wetland invertebrate assemblage, are discussed in section 7.</p> <p>Embedded mitigation measures are set out in Table 6.1.</p> <p>Assessment of adverse effects on Ramsar wetland invertebrate assemblage species is provided in section 11 (Thanet Extension alone) and section 12 (in-combination).</p> <p>The issue has been screened in for potential LSE (section 7) and therefore assessed for potential adverse effects on qualifying bird species for the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar in section 11 (Thanet Extension alone) and section 12 (in-combination).</p>
Kent Wildlife Trust response to the draft RIAA dated 18 th May 2018	<p>Distribution of Evidence Plan documents to interested parties.</p> <p>KWT noted that the RIAA document should have been circulated to interested parties and stakeholders to ensure transparency in the process and a better level of understanding of the project for those involved.</p>	VWPL have consulted with the Evidence Plan throughout with regards the RIAA and confirm that the RIAA will be available for review with the wider application documents following submission of the application.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Re-direction to other documents: KWT noted issues inherent in directing readers to other documents, identifying some of these were not available for review.</p>	<p>VWPL are aware that readers are referenced to more detailed documents for specific information at key points in the RIAA. This is partly to ensure that the RIAA remains at a manageable size but also to avoid overburdening consultees by presenting the same information multiple times. Please note that ES chapters do build on the PEIR, which is already available, with the HRA Screening Report having been issued for consultation in 2017. All the documents referred to in the RIAA will be available with the final application (unless specifically noted to follow).</p> <p>Please note that paragraph 5.3.3 of the RIAA (within section 5.3 Consideration of Alternatives) references the ES chapter and not the PEIR chapter.</p>
	<p>Onshore Cable replacement; request for additional information on the reasons for the Thanet Cable Replacement Project being cancelled.</p>	<p>Further consideration of Thanet Cable Replacement (beyond identification of the withdrawal of the project and therefore its removal from consideration within the Thanet Extension RIAA) is not considered relevant to this document or Application. No further update or information is therefore available or provided here.</p>
	<p>Onshore consideration of alternatives. Issues and questions raised relating to site selection and highlighting that KWT consider that alternatives should be considered prior to applying mitigation to reduce effects on an option selected which interacts with designated sites.</p>	<p>Please note that 3 options remain for the landfall option.</p> <p>Reference to where site selection and alternatives is addressed has been added to the Natural England comment.</p> <p>Regards Section 5.3 of the RIAA, this section is not intended to present the results of consultation (or the position of individual consultees), with that information presented in Table 4.1. The purpose of this section is to summarise the process followed and who has been involved.</p> <p>Regarding the designations mentioned at the landfall, please note that the RIAA is only concerned with the SAC, SPA and Ramsar. All designations are addressed within the ES. As regards consideration of site selection and alternatives, this is presented in the PEIR and has been updated within the main ES chapter as referenced here (volume 1 chapter 4).</p>
	<p>Onshore habitat loss – welcomed the inclusion of certain wetland invertebrate species in the RIAA but suggested that other species and assemblages should also be included, including the plant species tansy (<i>Tanacetum vulgare</i>) which supports an assemblage of nationally rare invertebrates.</p> <p>Disagreed that habitat loss for breeding little tern should be screened out and noted that substantial efforts to encourage little terns to return to breed in the SPA were ongoing.</p>	<p>Natural England has confirmed that the wetland invertebrate assemblage qualifying feature for the Thanet Coast and Sandwich Bay Ramsar Site refers only to the 14 species listed in Section 22 (page 6) of the Ramsar Information Sheet. Of these species, only three species (<i>Eluma caelata</i>, <i>Alysson lunicornis</i> and <i>Ectemnius ruficornis</i>) could potentially be present within Stonelees based on their habitat requirements (see ES Volume 5, Annex 5-6: Invertebrate Assessment (Document Ref: 6.5.5.6)). The other invertebrate species and assemblages referred to, including invertebrates associated with tansy, are therefore not relevant to the RIAA. An assessment of effects on invertebrates not forming part of the Ramsar wetland invertebrate assemblage is provided in the ES, Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5).</p> <p>As set out in Section 7.5 of the RIAA, little tern has not bred at Pegwell Bay for a number of years. Furthermore, the former breeding site was located to the east of the River Stour, which will not be affected by the proposed development. Both Natural England and RSPB have agreed that LSE relating to habitat loss for little tern can be screened out.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Offshore habitat loss.</p> <p>Further detail requested on the increase in subtidal benthic habitat loss (since PEIR) and the habitats affected.</p> <p>KWT questioned the loss of chalk reef as a 'temporary' impact.</p> <p>Anchoring on chalk seabed identified as being highly damaging to the habitat and should not be permitted during construction or O&M activities.</p>	<p>Further detail on this is provided within the relevant chapter of the ES (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology), which updates that of the PEIR. The RIAA takes account of offshore habitat loss as it relates to the relevant designated sites only, with the ES addressing all habitat loss.</p> <p>The comment regarding chalk reef in the Thanet Coast SAC - is presumed to relate to Table 7.3. Potential for habitat loss or disturbance is considered during construction/decommissioning (with any such affects being temporary) and in O&M (with any such effects being permanent). Please note that this table relates to issues screened in for LSE - ie the issues carried forward to subsequent sections of the RIAA.</p> <p>The comment regarding vessel anchoring has been deleted. Regarding chalk reefs, please note the committment to micro-siting referenced in Table 6.1.</p>
	<p>Offshore micro-routing and micro-siting.</p> <p>KWT queried the potential to avoid the Thanet Coast SAC and MCZ entirely and if not possible then micro-routeing should be adopted to avoid key features. The potential for Sabellaria reefs to form in the area was also highlighted.</p>	<p>The MCZ is addressed separately and is not within the RIAA.</p> <p>See Table 6.1 for confirmation of micrositing.</p> <p><i>Sabellaria spinulosa</i> reef are not included as a feature within any of the designated sites assessed and therefore have not been assessed within the RIAA. Biogenic reefs are addressed within the ES.</p>
	<p>Offshore mitigation efforts</p> <p>Requests made that the principles underpinning the Biogenic Reef Mitigation Plan would commence with avoidance as a first step, with mitigation brought in where this is not possible.</p> <p>Information was also sought on the timings of UXO clearance as well as the opportunity to see details of the mitigation plans associated with the project as and when these become available.</p>	<p>Regarding the biogenic reef mitiation plan, we would refer you to Table 6.1 where it references the plan including that it will be developed and agreed with the relevant stakeholders prior to construction and secured through the DCO.</p> <p>Please note that the MCZ is not part of the RIAA but is considered within the ES.</p> <p>Consultation on the MMMP (piling) will follow. Should a requirement for UXO clearance be confirmed, then a UXO-MMMP will be drafted as part of the Marine Licence application, including consultation, at that point.</p> <p>The various mitigation plans will be issued as noted in Section 8.5.</p>
	<p>MCZ assessment; KWT noted its enthusiasm to review the MCZ assessment, raising the need to include the Goodwin Sands rMCZ.</p>	<p>The MCZ assessment is outwith the RIAA.</p>
<p>Natural England response to the draft RIAA dated 21st May 2018</p>	<p>Sweetman II Judgement</p> <p>NE identified that, though an official position is yet to be determined, the Sweetman II case should be considered with respect to the screening of LSE.</p>	<p>LSE screening has been revisited, with any effects previously screened out based on relevant mitigation screened back in (see Sections 7 and 8) and subsequently assessed for AEoI in Sections 11 and 12 as appropriate.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Loss of saltmarsh habitat</p> <p>NE noted that of the three landfall options, the decision on two of these relied upon additional data being collected and suggested that it would welcome the acquisition of such data as soon as possible.</p> <p>NE also noted that the permanent loss of saltmarsh habitat raised the potential for a LSE to occur on the Thanet Coast and Sandwich Bay SPA and Ramsar (as a supporting habitat) and subsequently advised the Competent Authority that on this basis an Appropriate Assessment would therefore be required.</p>	<p>Regarding the permanent loss of saltmarsh, we refer you to paragraph 7.5.19 onwards and in particular paragraph 7.5.25, which states:</p> <p>'Overall, it is concluded that there will therefore be no permanent loss of saltmarsh habitat suitable for non-breeding European golden plover and ruddy turnstone and therefore the permanent loss of saltmarsh habitat for these features, with respect to both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar, has been screened out. Disturbance within the muddy foreshore and open saltmarsh remains screened in, with the loss of saltmarsh assessed in full within the relevant sections of the ES.'</p> <p>Additional comment to the quality of the saltmarsh has been added in paragraph 7.5.19.</p> <p>As highlighted in Table 6.1, a Saltmarsh Mitigation and Reinstatement Plan will be produced and submitted as part of the application and secured through the DCO.</p> <p>Regarding the three landfall options, the outcome of any site investigation undertaken pre-consent would be used to refine the optionality presented in the application and is not required to inform the EIA or other assessments. The application fully considers and assesses the three landfall options, each of which include embedded mitigation to ensure there are no significant environmental effects as a result of these works.</p>
	<p>Cable route selection</p> <p>NE stated that the final landfall location seemed to have comparable interactions in terms of the number of designated sites with other options put forward, with more precaution afforded to options further east. Whilst NE accepted that issues around designated sites had been considered, NE felt that the options put forward appeared to be based on the number of site interactions rather than actual sensitivity and recoverability within the sites. NE require further justification and detail around the current landfall locations before agreement can be made.</p>	<p>The RIAA summarises site selection and alternatives in section 5.3, drawing on Volume 1 Chapter 4 of the ES where these are considered in more detail. Final selection of the landfall option is dependant on site investigation works that are pending.</p>
	<p>Core reef approach</p> <p>NE questioned whether there is enough data to successfully identify where areas of core reef occur and what index would be appropriate to use to determine areas of core reef based on the available data.</p> <p>NE advised that the developers present their approach to it for comment as soon as possible. Without an agreed core reef approach any reef areas found in a pre-construction survey should be avoided. As per previous advice a core reef approach is more appropriate to permanent and on-going activities such as foundation locations. For short-term activities such as cable laying it may be more appropriate to avoid reef that is found in a recent survey</p>	<p><i>Sabellaria</i> reef is not a feature of any of the designated sites included within the RIAA. However, the biogenic reef mitigation plan, as referenced in Table 6.1 and will be developed in consultation with stakeholders and submitted with the DCO, will also take account of any chalk reef, should any be identified during pre-construction surveys. Additional reference has been added to table 6.1 to highlight this.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>Chalk habitat and cabling through Thanet SAC</p> <p>NE raised concerns about the potential interaction of cabling operations within the Thanet SAC and the sites associated features, primarily the chalk habitat. As has been noted the cable corridor impinges only slightly on the SAC, and there have been discussions stating that there is no chalk habitat in the vicinity of the cable corridor. NE require further evidence regarding this and advise that cabling and associated cable protection should be avoided within this site. Without this further evidence NE cannot currently agree there will be no likely significant effect (LSE) to the site.</p>	<p>Thanet SAC (chalk reefs) has been screened in for LSE on a number of issues, with these assessed further.</p> <p>Specifically regarding habitat loss and disturbance, the issue is assessed during construction/decommissioning in 13.2.12 <i>et seq</i> and for O&M in 13.2.55 <i>et seq</i>. It can be confirmed that the site specific surveys carried out did not identify the presence of the designated chalk reef feature. As stated in both the construction/decommissioning and O&M sections, should any designated chalk reef feature be identified during the preconstruction surveys, then appropriate measures will be taken to ensure no direct loss of the designated chalk reef (micrositing). The commitment is provided for through the biogenic reef mitigation plan, as referenced in section 13.2 but also in Table 6.1.</p>
	<p>Signposting of evidence used to support statements</p> <p>NE highlighted that throughout the [draft] RIAA references are made to documents that supposedly provide more evidence or contain further information on potential mitigation measures. NE have not seen the vast majority of these documents and assume they are associated with the environmental statement which is yet to be submitted. As a result, NE cannot fully determine the conclusions of LSE without this further evidence and mitigation options.</p>	<p>It is acknowledged that the draft RIAA referenced documents that have not yet been provided. However, it is also noted that these documents will be prepared (where relevant) in consultation with statutory bodies, including Natural England (where relevant). The documents will be available at the time of application (unless specifically stated). The RIAA is clear where these documents are held and (where relevant) how they will be secured.</p> <p>It is not the intention of the RIAA to reproduce all supporting documents, to avoid unnecessary repetition.</p>
	<p>Conclusions on Likely Significant Effect</p> <p>Overall, NE determine that the application should move to the AA stage. Several conclusions of no LSE and Adverse Effect on Integrity (AEoI) have been made without sufficient evidence currently being presented, furthermore sufficient information on mitigation plans have not yet been developed nor agreed. On the latter point, and as stated above, the Sweetman II judgement has now determined that any mitigation measures have now got to be taken forward to be considered at the AA stage.</p>	<p>The RIAA, or Report to Inform Appropriate Assessment, is intended to provide the competent authority with the information necessary to undertake an Appropriate Assessment. It is therefore considered that an AA will follow (as stated here).</p> <p>Consideration of the Sweetman II judgement has been incorporated in the assessment.</p> <p>It is noted that of the comments provided, there is comment on the consideration of LSE and AEoI. It is intended that the responses provided to the general comments will address these concerns.</p>
	<p>General Comments</p>	
	<p>General comment 1</p> <p>Section 5.2 (Table 1) - As the environmental statement has not yet been submitted, NE cannot successfully refer to documents referenced throughout the RIAA.</p>	<p>Noted - these will be available at application (unless specifically noted to follow)</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 2</p> <p>Section 5.2.3 – NE note that there have been slight changes to the landfall options since the publication of the PEIR. It is not particularly clear what these options entail, especially options 1 and 3. It would help to provide a figure to visually represent the changes to these options.</p>	<p>It is correct that changes have been made to landfall options since PEIR. The final option has not yet been selected, the final design to be determined following site investigation works and in line with the DCO. The RIAA has assessed the option that represents the worst-case scenario only and full details of each scenario have not been presented here. Further detail on each option (including diagrams) is provided within Volume 2 Chapter 1: Project Description.</p>
	<p>General comment 3</p> <p>Section 5.3.5 - NE note that several landfall locations/ routes and their potential interactions with designated sites and sensitive features were considered within the PEIR. However, as stated in our PEIR response, the final landfall location seems to have comparable interactions in terms of the number of designated sites with other options put forward, with more precaution afforded to options further east. Whilst NE accepted that issues around designated sites had been considered, NE felt that the options put forward appeared to be based on the number of site interactions rather than actual sensitivity and recoverability within the sites. NE require further justification and detail around the current landfall locations before agreement can be made.</p>	<p>The RIAA does not detail full consideration of all alternatives, but instead assesses the worst-case scenario for each. Full detail on each option is provided in Volume 2 Chapter 1 Project Description, with alternatives addressed in full in Volume 1 Chapter 4 Site Selection and Alternatives.</p>
	<p>General comment 4</p> <p>Table 5.2 (Row 2) - NE note that these figures have been refined since the publication of the PEIR. We also note that ploughing looks to have been confirmed as the preferred burial technique. NE need reassurances that this technique will be successful in burying the cable without remedial works in the future, particularly as it was not successful for many of the inter-array cables at the Thanet project location. Any lessons that can be learnt from the recent NEMO works or the original Thanet cable should be put into practice</p>	<p>We agree that it is important that the construction techniques selected are successful and it is the intention of Vattenfall to ensure that this is the case. However, should there be a need for remedial works, these are provided for in the assessment.</p>
	<p>General comment 5</p> <p>Table 5.2 (Row 6) - There is some inconsistency between rows 2 and 6. In row 2 it states that inter array and export cables will be installed by ploughing whereas in row 6 it states jetting. Has the installation technique been decided upon? Are there other techniques which could be assessed which would be more effective in this area, given that both ploughing and jetting were unsuccessful at the Thanet project site for inter-array cables.</p>	<p>All options available are detailed in Volume 2 Chapter 1: Project Description. For the purposes of Table 5.2, this presents the maximum design scenario relevant to each project parameter and each receptor group. Depending on the parameter/receptor combination, the design scenario that represents the maximum may differ. The approach ensures that the worst-case has been assessed.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 6 – Requested clarification of the location of areas within the SPA that could be directly affected (Table 5.2 (Row 7)).</p>	<p>The figure of 10.500m² of the SPA and Ramsar which could be disturbed (Table 5.2) relates to the area within Stonelees Nature Reserve (corridor of length 350m x 30m width), which will be affected by cabling works. The Transition Joint Bays (TJBs) and substation will not be located within the SPA and Ramsar. The wording in Table 5.2 has been amended to clarify this point.</p>
	<p>General comment 7 – Requested regular updates from the Ecological Clerk of Works (ECoW) during the works. Requested site of the Saltmarsh Mitigation and Reinstatement Plan as soon as possible.</p>	<p>The ECoW will provide regular updates throughout the works. Text has been added to Table 6.1 to address this. A Saltmarsh Mitigation, Reinstatement and Monitoring Plan is provided with the Application (Document Ref: 8.13).</p>
	<p>General comment 8 Table 6.1 (Row 4) - Every effort should be made to bury the cables sufficiently. Cable protection should not be assumed to be used for mitigating the effects of EMF, especially in protected sites. The adverse effects of using cable protection may be a lot greater than EMF, especially in a soft sediment dominated area. Additionally, the benefits and disadvantages should be considered on a location specific basis rather than defaulting to cable protection as mitigation for EMF impacts.</p>	<p>It can be confirmed that every effort will be made to bury the cable sufficiently, however measures are required in case this is not feasible. The assessment includes consideration of cable protection (to a maximum level identified in Table 5.2) in case cable protection is not achieved sufficiently. Please note the project commitment not to use cable protection in the intertidal (soft sediments within designated sites).</p>
	<p>General comment 9 – questioned the buffer of 250m for works between October and Marsh which are not covered by seasonal restrictions. Noted that timing restrictions will now need to be incorporated into an Appropriate Assessment as mitigation, rather than used to screen out LSE for bird disturbance.</p>	<p>Annex 5-7 of the PEIR proposed a maximum zone of influence of 250m for all SPA, Ramsar and SSSI intertidal waterbird qualifying interest species. No objections to this were raised in Section 42 consultation responses. The 250m distance was based on a combination of professional judgment and relevant literature, e.g. Cutts <i>et al.</i> (2009) and Collop <i>et al.</i> (2016). It is accepted that very loud infrequent noise (i.e. driven piling) may cause disturbance at greater distances, however any piling associated with cofferdams required during construction at the landfall and TJBs will be subject to timing restrictions. Further detail has been added to Table 6.1 and Section 11.5 of the RIAA to address this point. Following the Sweetman 2 ruling the mitigation provided by the proposed timing restriction is no longer included in the consideration of LSE. LSE is therefore no longer screened out and the assessment of disturbance to SPA and Ramsar qualifying waterbird species is now assessed in Section 11 of the RIAA.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 10 – stated that screening for the TJBs will have to be particularly effective. Suggested a monitoring condition is put in place for any works on the periphery of the 250m buffer to monitor potential disturbance to birds, sound levels and movements of plant traffic. Requested further discussions regarding these works and monitoring.</p>	<p>Further information regarding proposed screening is provided in the Outline Landscape and Ecology Management Plan (LEMP) (Document Ref: 8.7). The production, agreement and implementation of a detailed LEMP forms the subject of a DCO Requirement (Document Ref: 3.1) and the final screening proposals will therefore be subject to agreement with Natural England. Most noise associated with construction of the TJBs and cabling works will be regular in character and birds are therefore likely to quickly habituate to it. Any percussive piling associated with works at the landfall or TJBs will be subject to timing restrictions. Further details have been added to Table 6.1 and Section 11.5 of the RIAA to address these points.</p> <p>Monitoring during construction is not proposed due to the difficulty in attributing any observed disturbance to construction works at a site which is already subject to high levels of recreational disturbance.</p>
	<p>General comment 11 – welcomed consideration given to mitigating possible effects of displacement of recreational visitors from the country park. Requested regular updates from the ECoW on this issue during the works.</p>	<p>The ECOW will provide regular updates throughout the works. Text has been added to Table 6.1 to address this.</p>
	<p>General comment 12 Section 7.5.5 - NE query which plans had been prepared in consultation with ourselves? Although we accept sufficient plans should and will be in place to minimise the potential of accidental pollution, it would be naïve to determine at this stage, without further SI data, that accidental pollution has been determined to be no LSE. This is particularly true at the landfall location, with the potential interaction with the landfill.</p>	<p>Additional text has been added as paragraphs 7.5.5 and 7.5.7, to highlight that the landfall option has not yet been selected. The final option selected, together with the detailed design, will be informed by the findings of the site investigation works. Each option includes embedded mitigation to manage the risk of accidental pollution by avoiding the introduction of a contamination pathway, as required by the wider consenting for the project. The CMS includes provision to ensure that the final option selected would not result in such a contamination pathway, as part of that embedded project design. It is therefore considered that the conclusion on no LSE remains appropriate.</p>
	<p>General comment 13 – requested details of relevant mitigation measures included for Richborough Connection and Discovery Park.</p>	<p>Brief details of relevant mitigation measures proposed for Richborough Connection and Discovery Park are provided in Table 12.1.</p>
	<p>Benthic, Intertidal and Subtidal</p>	
	<p>General comment 14 Table 5.2 Page 5-36 – There has been no specific amount or worst-case scenario provided for potential direct disturbance to benthic ecology due to cable repairs and the potential for LSE if these repairs were to take place within designated sites. As a result, no cable repairs can be currently permitted. This means that the application cannot be considered complete.</p>	<p>Additional clarification to project description added to row 4 under O&M in Table 5.2, together with additional consideration in paragraph 11.2.50 <i>et seq.</i> Please note that comment was provided in paragraph 11.2.56 that 'should any maintenance be required along the length of the OECC that falls within (or in close proximity to) the Thanet Coast SAC, appropriate measures would be taken to ensure no loss of any chalk reef feature, with these to be determined in relation to the required works and the results of any surveys undertaken at the time'.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 15</p> <p>Table 6.1 Page 6-44 – Currently no core reef approach has been agreed and NE question whether there will be enough data to successfully identify these areas of core reef. Without an agreed approach any reef areas found in pre-construction surveys should be avoided.</p>	<p>The core reef approach is mentioned here in relation to the biogenic reef mitigation plan only as none of the designated sites considered within the RIAA include Sabellaria reef as a feature. However, the biogenic reef mitigation plan does include a proviso for chalk reef, hence its relevance here.</p>
	<p>General comment 16 – stated that saltmarsh is a supporting habitat for the birds of the Thanet Coast and Sandwich Bay SPA and therefore must be considered with regards to the conservation objectives of the site. Noted that NE is currently working towards updating conservation advice for European Marine Sites (EMS) in which supporting habitats will be clearly highlighted.</p>	<p>Although it is noted that Natural England is currently updating the conservation advice package for the EMS that information has not yet been made available. Saltmarsh is not listed as a sub-feature for the SPA in the current Regulation 33 document for the North East Kent EMS. Whilst it is agreed that some of the saltmarsh within the SPA provides supporting habitat for qualifying features, the area of upper saltmarsh that could be permanently lost does not provide suitable habitat for them, as set out in section 7.</p>
	<p>General comment 17</p> <p>Section 11.2.6 to 11.2.8 - NE note that the Thanet Coast SAC overlaps with the Offshore Export Cable Corridor (OECC). From looking at previous figures with the OECC in relation to the SAC it is unclear how much, if any, of the cabling activities will actually be taking place within the SAC, as the width of the OECC is wider than the cable itself. NE would like a more accurate figure of the likely disturbance within the designated site, and we advise that interactions with the SAC, should be avoided in the first instance where there is an option within the cable corridor.</p>	<p>The text in sections 11.2.6-11.2.8 is intended to give overall information, to be drawn on for the following consideration of relevant designated sites. The information requested for the OECC within the Thanet Coast SAC is presented in paragraph 11.2.12 <i>et seq.</i></p>
	<p>General comment 18</p> <p>Section 11.2.12 - This paragraph needs rewording slightly. NE acknowledge that only a small percentage of the SAC will be disturbed, however we question why the OECC could not be refined further in this area to totally avoid the SAC. NE assume this is taking into account the worst-case scenario of utilising 4 export cables, however if only two were required would that reduce the RLB further to avoid the SAC? Avoiding the SAC would reduce the potential for mitigation works, and there is always the potential of further disturbance during the O&M phase.</p>	<p>Paragraph 11.2.12 has been updated with further information on the width of the area of overlap, to clarify that the cable that could be installed within that area of overlap. Noting that any such cable installation would be subject to the mitigation provided for chalk reefs (namely preconstruction surveys, resulting in the avoidance of any identified chalk reef).</p>
	<p>General comment 19</p> <p>Section 11.2.15 – NE advises that further evidence is provided to prove that the current cable corridor does not overlap with the chalk habitat in Thanet SAC. Currently there is not enough evidence to determine that there would be no AEoI. Preferably, maps depicting the cable corridor with known areas of chalk habitat overlain would provide a further evidence of the potential effects.</p>	<p>Please note that no chalk reef has been identified during site specific surveys. Therefore there is no data on the location of chalk reef to overlay on the cable corridor. The project commitment, as referenced in paragraph 11.2.14, to undertake pre-construction surveys will, as part of the biogenic reef mitigation plan, confirm the presence/absence of any chalk reef within the Thanet Coast SAC along the cable corridor and enable micro-siting to avoid any such reef, if identified.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 20</p> <p>Section 11.2.17 – As recently discussed, NE would need to see a detailed saltmarsh mitigation plan as soon as possible, before we can agree there is no adverse impact or loss of functionality. Detailed maps and photos of the landfalls proposed impacts would allow us to effectively assess the likely significant effect. It should also be noted that although the saltmarsh around the original Thanet cable has recovered well, it cannot be assumed the same would occur at this proposed landfall site. Recent observations of the landfall area of the NEMO interconnector have indicated that the topography of the saltmarsh has changed, creating an area of standing water potentially hampering recovery. This change in topography should be considered and avoided.</p>	<p>The Saltmarsh Mitigation, Reinstatement and Monitoring Plan, as referenced in paragraph 11.2.20 and in Table 6.1, has been provided and submitted as part of the application (Document Ref: 8.13).</p>
	<p>General comment 21</p> <p>Section 11.2.39 – NE query if the effects of suspended sediment can reach Margate and Long Sands SAC, then should the aggregate extraction be screened in for the in-combination assessment? Furthermore, NE have an updated conservation advice package for this site which can help determine the potential effects of increased sedimentation levels. Overall, NE agree there would no adverse effect alone.</p>	<p>Additional text has been added to paragraph 11.2.31 to highlight that beyond the immediate area of works (ie within a few 100m and therefore not extending the 3km minimum range between the array boundary and the Margate and Long Sands SAC boundary) the sediment plume would be formed from fine grained material that will not settle with measurable thickness.</p> <p>Further, it can be noted in paragraph 2.10.52 of Volume 2 Chapter 2: Marine Geology, Oceanography and Physical Processes, in relation to the magnitude of impact on sand banks including the designated Margate banks, that no sediment would be removed from the system and therefore sediment supply to the banks would remain unaltered.</p> <p>It is clear from the assessment that, at most, any effect would be negligible and unmeasurable. On that basis, it is not considered that the construction, operation & maintenance or decommissioning of Thanet Extension would have any greater effect on the Margate and Long Sands SAC above de minimis and therefore there would be no need to consider an in-combination assessment with other activities including marine aggregate dredging.</p>
	<p>General comment 22</p> <p>Section 11.2.56 – The developers need to be confident that if the cable was protected along the whole length going through the Thanet SAC that it would not impact on any features. There is currently not enough information to support that conclusion yet. If there is overlap with features then an AA is recommended as there may be a permanent impact. Additionally, if the cable route allows the developers to wholly avoid the SAC then this should be the preferred option. Regardless, areas of chalk habitat should be avoided.</p>	<p>Please note that no chalk reef has been identified during site specific surveys. However, as noted above there is a project commitment, as referenced in paragraph 11.2.14, to undertake pre-construction surveys which will, as part of the biogenic reef mitigation plan, confirm the presence/absence of any chalk reef within the Thanet Coast SAC along the cable corridor and enable micro-siting to avoid any such reef, if identified.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 23</p> <p>Section 11.2.56 – Within this section it states: ‘...should any maintenance be required along the length of the OECC that falls within (or in close proximity to) the Thanet Coast SAC, appropriate measures would be taken to ensure no loss of any chalk reef feature, with these to be determined in relation to the required works and the results of any surveys undertaken at the time.’ If the developer wants a dML that includes maintenance of the cables, then they need to fully consider what that would entail or apply for a separate license for maintenance post consent. However, this is not recommended as it would mean the application is incomplete as all potential impacts of the project are not fully considered.</p>	<p>Additional text has been added to paragraph 11.2.55 and 11.2.56.</p>
	<p>General comment 24</p> <p>Section 11.2.59 - Lessons learnt from other recent offshore windfarms have highlighted the problems of cabling in the intertidal area, especially when the cable is damaged during construction. Every effort should be made to ensure the cables are fit for purpose so when trenching and burial has occurred they do not have to be revisited either immediately or during the lifetime of the project. This will ensure disturbance levels will be kept to minimum and the ban on works during the overwintering period will be maintained.</p>	<p>It is agreed that every effort will be made to ensure that cables are fit for purpose and it is in the interest of the project to do so.</p>
	<p>General comment 25</p> <p>Section 11.2.70 – Stating the minimum cable burial depth/ amount of cable protection would be more useful than stating the maximum scenarios. NE wish to ensure that the developers confidence in achieving the correct burial depth is high. Additional cable protection within an SAC is highly undesirable and should be avoided.</p>	<p>The minimum burial depth is 0m (as reported in table 1.9 Volume 2 Chapter 2: Project Description (Offshore)). However, as noted in the RIAA it is intended to seek a depth of 3m depending on the cable burial risk assessment. Where cable cannot be sufficiently buried, provision is made for cable protection. Both these scenarios have been assessed.</p> <p>Please note the project commitment to avoid use of cable protection in the intertidal (and hence in the designated sites within that area) together with the mitigation for micro siting within the Thanet Coast SAC, to avoid chalk reefs (should any be identified during pre construction surveys) and should cable protection be required there.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 26</p> <p>Section 11.2.77 – For this section and other sections where suspended sediment is discussed, it would be good to state the worst-case scenario depth and the area of potential smothering.</p>	<p>Paragraph 11.2.77 <i>et seq</i> relates to the O&M phase of works, stating in paragraph 11.2.76 that 'minor amounts of sediment may be released into suspension, with subsequent deposition, during the O&M phase, for example should cable repairs be required or resulting from scour. However, the degree of sediment disturbance and any resulting increase in SSC and subsequent deposition will be much reduced when compared to the construction phase'.</p> <p>It is clear that the construction (and decommissioning phase) has the potential to result in greater levels of sediment being released than the O&M phase, with that aspect considered in greater depth in paragraph 11.2.27 <i>et seq</i> (with minor changes made to paragraph 11.2.31). Here greater detail on sediment levels in suspension and the range that such sediment may travel is provided, together with deposition rates in proximity to foundations and cables. The assessment concluded no adverse effect during construction and therefore the reduced levels of sediment that may be released (and deposited) during O&M were similarly found to result in no adverse effect.</p>
	<p>General comment 27</p> <p>Section 11.2.81 - Have the in-combination effects from dredging been considered?</p>	<p>As noted in the response to general comment 21 above, additional text has been added to paragraph 11.2.31 to highlight that beyond the immediate area of works (ie within a few 100m and therefore not extending the 3km minimum range between the array boundary and the Margate and Long Sands SAC boundary) that the sediment plume would be formed from fine grained material that will not settle with measurable thickness.</p> <p>Further, it can be noted in paragraph 2.10.52 of Volume 2 Chapter 2: Marine Geology, Oceanography and Physical Processes, in relation to the magnitude of impact on sand banks including the designated Margate banks, that no sediment would be removed from the system and therefore sediment supply to the banks would remain unaltered.</p> <p>It is clear from the assessment that, at most, any effect would be negligible and unmeasurable. On that basis, it is not considered that the construction, operation & maintenance or decommissioning of Thanet Extension would have any greater effect on the Margate and Long Sands SAC above de minimis and therefore there would be no need to consider an in-combination assessment with other activities including marine aggregate dredging.</p>
	<p>Marine Mammals</p>	
	<p>General comment 28</p> <p>Table 7.3 Page 7-61 – Unexploded Ordinances (UXOs) are not mentioned in the potential for LSE with other construction activities and the Southern North Sea cSAC for harbour porpoise.</p>	<p>UXO is not mentioned specifically in the table, as construction noise in general is referred to here to cover all aspects, but is included within the assessment. The table has been amended to include mention of UXO.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 29</p> <p>Section 8.3.4 – While there is no future information on oil and gas projects, it should be possible to provide a generic assessment of average oil and gas activities across the relevant area based on historic activity or on the marine noise registry.</p>	<p>It is considered that it is not possible or appropriate to predict future oil and gas activities beyond those known and applied for, with the assessment made on best available information which can be sourced from the public domain. Any future licensable activities, where appropriate, would be expected to undertake their own assessment at that time.</p>
	<p>General comment 30</p> <p>Section 8.3.6 – Data can also be provided by the MMO on offshore wind farms that are, or plan to, detonate UXOs. Over 30 UXOs have been found in certain locations associated with wind farm development. Therefore, it is a fair assumption that other wind farms in the vicinity will find similar numbers, which can be built into the assessment. NE does not agree that UXOs can be considered de minimis and believe an assessment should be undertaken within the HRA.</p>	<p>Paragraph 8.3.6 refers to the OSPAR data only - this being a record of historic UXO clearance across the OSPAR region. Closer examination of these data revealed that within 2014, just 5 UXO were detonated in-situ within 26km of either the winter or summer extents of the SNS cSAC. Further, it is noted that discussions with Dutch officials revealed that clearances in Dutch waters were expected to decrease from such levels. It is in relation to such wider UXO clearances that the conclusion of very low risk and de minimis has been drawn. Project specific UXO clearance however (where known in the public domain) has been screened in for assessment.</p>
	<p>General comment 31</p> <p>Table 8.4 – Hornsea 2 is not under construction at the current time.</p>	<p>Noted - Hornsea Project 2 has been deleted from the relevant part of Table 8.4.</p>
	<p>General comment 32</p> <p>Section 10.3.2 – 10 km is the EDR for small seismic (airgun) surveys after the 2013 Thompson paper. Larger airgun arrays may cause larger deterrent distances and other types of equipment (SBPs) may cause smaller deterrence distances.</p>	<p>Paragraph 10.3.2 has been amended to refer to small air guns for the 10km range.</p>
	<p>General comment 33</p> <p>Section 11.3.11 to 11.3.13 – NE notes that the introduction of the NOAA 2016 thresholds has meant that the potential auditory injury zone (PTS) can be much greater than previously thought. Therefore, NE will require noise modelling of the range of potential UXOs on site to determine potential injury zones and relevant mitigation. It should be noted that 100% deterrence cannot be guaranteed after approximately 1km. Vattenfall need to be aware that ADDs may not be sufficient as mitigation and other options may be required (and should be considered now, potentially with other developers, given the lead in time before any UXO detonation will be required). In terms of paragraph 11.3.13 NE notes that individual animals are EPS and are therefore protected from injury.</p>	<p>The consideration of UXO (including risk of PTS) has drawn on Volume 2 Chapter 7 (Marine Mammals). It can be confirmed that underwater noise modelling for UXO has been undertaken and applied the NOAA 2016 thresholds.</p> <p>Comment has been added to paragraph 11.3.10 to highlight this.</p>
	<p>General comment 34</p> <p>Section 11.3.16 – A reference to figure 11.2 is required.</p>	<p>Figure reference added.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 35</p> <p>Section 11.3.97 – NE suggests that a condition stating that Thanet Extension cannot undertake more than one activity (piling / UXO detonation / geophysical survey) within a single 24 hour period is put on the licence.</p>	<p>The assessment is based on that scenario, however it is noted that sufficient headroom remains within the daily (20%) and seasonal (10%) thresholds to enable further relevant activity. As such it is not proposed to include a restriction within the DCO on undertaking more than one activity in 24 hours to provide for flexibility going forward.</p>
	<p>General comment 36</p> <p>Table 12.1 – This table references the scoping report for Hornsea 3 which is out of date. The PEIR for Hornsea 3 was issued in July 2017, so there has been time for this section to be updated with more relevant information. The PEIR for Hornsea 3 states that construction (piling) is due to take place between 2022 and 2023. In addition, the more up to date Norfolk Vanguard PEIR states that Norfolk Boreas could be constructing in 2023. These wind farms need to be built into the assessment.</p>	<p>Reference to Hornsea Project Three has been updated throughout using the PEIR. Information used on individual projects has been drawn from project specific literature only and therefore, for Norfolk Boreas, is limited to the Scoping report. No change has been made for that project.</p>
	<p>General comment 37</p> <p>Table 12.2 – This table (and subsequent calculations) requires updating to reflect that Hornsea 3 could be constructing at the same time as Thanet Extension. In addition, the developers should confirm whether Norfolk Boreas could be constructing at the same time as Thanet Extension and the table updated accordingly (as suggested by the Norfolk Vanguard PEIR).</p>	<p>As above, reference to Hornsea Project Three has been updated throughout using the PEIR. Information used on individual projects has been drawn from project specific literature only and therefore, for Norfolk Boreas, is limited to the Scoping report. No change has been made for that project.</p>
	<p>General comment 38</p> <p>Figure 12.2 – It would be helpful if this figure had the cSAC boundary (plus summer winter boundary) on it.</p>	<p>Figure has been updated to include the SNS cSAC (including seasonal extents) and Hornsea Project Three.</p>
	<p>General comment 39</p> <p>Section 12.3.7 – Other wind farms may still be undertaking UXO detonation at the same time as piling, for example EA3 – as evidenced by recent wind farms.</p>	<p>It is acknowledged that other projects may submit applications to clear UXO. However, until (and unless) such applications are submitted, it is considered that the assessment should only be (and can only be) undertaken on the basis of information in the public domain. As for the oil and gas seismic surveys referenced above (in response to general comment 29), the assessment has been based on known future activities rather than attempting to predict such activities that are not known at this time. These future activities (seismic surveys and UXO detonations) are licensable activities and, where appropriate, potential impacts from these types of activities would be assessed as part of the relevant applications for marine licences at that time. The assessment presented within the RIAA comprehensively covers the known activities with a risk of overlap.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 40</p> <p>Section 12.3.15 – NE does not agree with this paragraph. Thanet Extension has the same constraints as these tier 2-4 wind farms in terms of achieving CfD, so there is more chance of overlap. Thanet Extension must assess the potential in combination effects of all the wind farms that could overlap with its construction timeframes, as per every other development to date. In any case, if any of the listed wind farms was awarded CfD in late 2019, they could be commencing geophysical/UXO activities in 2021 and could foreseeably be piling by 2022, which is within the construction timeframe for Thanet Extension.</p>	<p>The Thanet Extension RIAA has adopted the standard tiered approach to in-combination assessment that has been used and agreed with NE in other RIAAs for the SNS cSAC. Whilst the concerns raised by NE are understood, it is not considered appropriate to predict activities of other future projects. As set out in our response to comments 29 and 39 above, the Thanet Extension RIAA must be based on known future activities.</p> <p>Further information on the justification for the approach is presented in paragraph 12.3.13 <i>et seq.</i></p>
	<p>General comment 41 Table 12.3 – The Dutch Borssele wind farms need to be added to this table and assessed in subsequent tables and text in terms of in combination impacts on the porpoise SAS cSAC.</p>	<p>The GIS shape files are now available for Borssele projects and the minimum distance recalculated (being 21km distant from the winter extents of the SNS cSAC at its nearest point). The assessment has been adjusted to include Borssele as a Tier 1 project for the SNS cSAC.</p>
	<p>Ornithology</p>	
	<p>General comment 42 – questions whether LSE can be ruled out in relation to noise and visual disturbance during construction. Accept that mitigation measures can be implemented and taken into account to remove any potential for adverse effect.</p>	<p>Following the Sweetman II ruling the mitigation provided by the proposed timing restriction is no longer included in the consideration of LSE. LSE is therefore no longer screened out and the assessment of noise and visual disturbance to SPA and Ramsar qualifying waterbird species is now assessed in Sections 11 and 12 of the RIAA.</p>
	<p>General comment 43 – noted that European golden plover and ruddy turnstone do not particularly favour areas of dense and tall vegetation. Requested an indication of the density of the vegetation currently at the proposed landfall location.</p>	<p>Further information regarding the approximate height of vegetation at the proposed landfall location has been added in Section 7.5.</p>
	<p>General comment 44</p> <p>Section 8.1.6 – It states: “... it is acknowledged that the potential contribution to an AEol in-combination by Thanet Extension could stem not only from those effects where LSE exists in relation to the project alone (as highlighted in Table 7.3 above), but also ... in-combination. As such, consideration has been given where the potential exists for Thanet Extension, despite no LSE alone, to contribute to LSE in-combination.” NE would disagree that there is no potential for LSE alone from Thanet Extension.</p>	<p>It is agreed that Thanet Extension has the potential to result in a LSE alone and in-combination. The purpose of the paragraph is to highlight that consideration of the project in-combination may include aspects that were considered below the threshold for LSE for the project alone.</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 45</p> <p>There needs to be an in-combination assessment of the displacement impacts of razorbill and guillemot from the Flamborough and Filey Coast pSPA.</p>	<p>Guillemot and razorbill were screened out because of the non-significant contribution to the in-combination effect, for instance <2 guillemot mortalities attributed to the Flamborough and Filey Coast pSPA (Section 8)</p>
	<p>Consideration to be given to screening in little gull in relation to collision risk, little gull being an interest feature of the Greater Wash SPA [noting that in the response it was described as a pSPA but the site was classified on March 28th 2018].</p>	<p>Little gull was screened out as it was only recorded on a single occasion, during the boat based survey carried out in January 2016 (Section 7).</p> <p>The approach to screening in those instances where only very small numbers were recorded in recent site based surveys is described in section 7 of the original Screening Report in Annex 1 (Document Ref: 5.2.1). Little gull fulfils the criteria for screening out.</p>
	<p>Clarity sought on why Sandwich, common and little tern are screened in for operational collision risk alone but screened out for operational collision risk in-combination.</p>	<p>The three tern species were screened out for operational collision risk in-combination because of the finding that alone the project makes a zero or negligible contribution (Section 7).</p>
	<p>Proposed that a 2 km buffer for displacement of red-throated diver was applied around construction vessels.</p>	<p>The site based evidence from the construction of the Thanet OWF was applied in the assessment that there was no displacement outside of the wind farm boundary in the construction period (Section 11).</p>
	<p>Sought that the assessment was carried out following the SNCB standard displacement approach of a 4 km buffer for effects on red-throated diver outside of the wind farm boundary.</p>	<p>The site based evidence from the construction and operation of the Thanet OWF was applied in the assessment that there was no displacement of red-throated diver outside of the wind farm boundary (Section 11).</p>
	<p>Sought that the assessment was carried out following the SNCB standard displacement approach of a 2 km buffer for effects on auks outside of the wind farm boundary.</p>	<p>The site based evidence from the construction and operation of the Thanet OWF was applied in the assessment that displacement of auks was limited to 1 km outside of the wind farm boundary Section 11).</p>
	<p>The PEIR Offshore Ornithology chapter contained an insufficient cumulative assessment of potential effects of disturbance and displacement on red-throated diver.</p>	<p>This RIAA contains an in-combination assessment of potential effects of disturbance and displacement on red-throated diver using an approach discussed and agreed in principle with Natural England (Section 12)</p>
	<p>Sought the detailed collision risk modelling information based on 24 months of survey.</p>	<p>This detailed information is provided in the CRM Annex to the ES Offshore Ornithology Chapter (Volume 4, Annex 4-2: Offshore Ornithology – Collision Risk Modelling (Document Ref 6.4.4.2)).</p>
	<p>Onshore Biodiversity</p>	
	<p>General comment 72 – welcomed the update to the screening of LSE for breeding little tern, noting that they are not currently breeding at the SPA and there is no imminent likelihood of recolonization.</p>	<p>Noted – no change required and little tern remains screened out (see section 7).</p>

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	General comment 73 - welcomed consideration given to mitigating possible effects of displacement of recreational visitors from the country park. Requested regular updates from the ECoW on this issue during the works.	The RIAA summarises site selection and alternatives in section 5.3, drawing on Volume 1 Chapter 4 of the ES where these are considered in more detail. Final selection of the land fall option is dependant on site investigation works that are pending.
	General comment 74 – encouraged the developer to progress the LEMP at the earliest opportunity.	An Outline LEMP is included as part of the application (Document Ref. 8.7).
	General comment 75 - welcomed consideration given to mitigating possible effects of displacement of recreational visitors from the country park. Requested further discussion to determine where best to utilise additional signage and monitor disturbance.	Further details of proposed mitigation for potential disturbance resulting from possible displacement of recreational visitors to Pegwell Bay Country Park will be developed as part of the detailed LEMP. The production, agreement and implementation of the detailed LEMP forms the subject of a DCO Requirement (Document Ref: 3.1). Text has been added to Table 6.1 to clarify this.
	General comment 76 – asked to receive the CEMP ideally before post consent.	A CoCP, which includes a section setting out the principles upon which a detailed CEMP will be based, is provided as part of the application (Document Ref: 8.1). A detailed CEMP will be provided in accordance with the CoCP pre-commencement. Table 6.1 has been updated to reflect this.
	General comment 77 – requested further justification for why remaining Ramsar wetland invertebrate assemblage species are not likely to be present.	The invertebrate assessment (ES Volume 5, Annex 5-6 (Document Ref: 6.5.5.6) provides detailed information on the habitat requirements of the 14 Ramsar wetland invertebrate species. This information has been used to determine the likelihood that assemblage species could be present within the RLB. An additional cross reference has been added in the relevant paragraph in section 7.5.
	General comment 78 – in relation to the in-combination assessment, NE highlighted a potential new housing development at the Manston Airport site, for which they have requested bespoke mitigation as well as a Strategic Access Management & Monitoring Plan (SAMM) contribution.	It is assumed that this comment refers to the proposed Stone Hill Park development, submitted in May 2018. A full review of plans and projects to be considered in the in-combination assessment has been conducted and reported in the ES, Volume 1, Annex 3-1: Cumulative Effects Assessment (Document Ref: 6.1.3.1). The list of project considered was finalised and agreed prior to submission of the Stone Hill Park proposal and it is not possible to include additional in-combination projects at this late stage in the application process.
	General comment 79 – content that residential developments which are not likely to have a direct effect on SPA qualifying features can be excluded from the in-combination assessment.	Noted – no change to the scope of the in-combination assessment is required.
	General comment 80 – highlighted that the North East Kent Site Improvement Plan (SIP) provides a high level overview of issues affecting the condition of the qualifying features of Thanet Coast SAC.	Noted – the assessment has considered relevant aspects relating to the SIP in relation to the Thanet Coast SAC, with the relevant aspects of the SIP (as these relate to designated features of the Thanet Coast SAC) highlighted in section 9.2.
	General comment 81 – highlighted that the SIP may also provide relevant information with regard to the Thanet Coast and Sandwich Bay SPA.	Section 9.4 has been updated to refer to the key issues affecting the condition of the SPA, based on the North East Kent SIP.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	<p>General comment 82 – noted that paragraph 11.5.14 referred to the use of a temporary warden at the country park to mitigate against possible visitor disturbance but that this was not reflected in Table 6.1.</p>	<p>Table 6.1 has been updated so it is consistent with section 11.5. To clarify, the proposed mitigation involves employment of either an ECoW or temporary warden / natural ambassador to monitor visitor disturbance to intertidal areas across all parts of Pegwell Bay during the sensitive October to March period and speak to visitors to discourage them from entering intertidal habitats, if required. Further details of proposed mitigation for potential disturbance resulting from possible displacement of recreational visitors to Pegwell Bay Country Park will be developed as part of the detailed LEMP.</p>
<p>RSPB response to the draft RIAA 18th May 2018</p>	<p>Section 4 - consultation. Table 4.1 - page 4.10 Paragraphs 4-6 – stated that RSPB is content that the permanent loss of saltmarsh is screened out in respect of the qualifying features for Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar and Sandwich Bay SAC. Stated that RSPB is content that permanent or temporary loss of habitat used by non-breeding European golden plover is screened out. Also content that the loss of breeding habitat for little tern and temporary increase in SSC is screened out.</p>	<p>We note and welcome RSPB agreement to the screening out of these effects.</p>
	<p>Sought information and results from the full 24 months of aerial survey.</p>	<p>This is provided in the Baseline Technical report that accompanies the ES (Volume 4, Annex 4-1: Offshore Ornithology – Baseline Technical Report (Document Ref 6.4.4.1)).</p>
	<p>Had concerns over the application of screening criteria for small numbers of birds recorded in surveys in the absence of the information and results from the full 24 months of aerial survey.</p>	<p>The provision of the aerial survey results in the Baseline Technical report that accompanies the ES (Volume 4, Annex 4-1: Offshore Ornithology – Baseline Technical Report (Document Ref 6.4.4.1)) will allow the RSPB to verify the application of the screening criteria.</p>
	<p>Sought information on the effects on collision predictions of the levels of uncertainty in CRM parameters.</p>	<p>This detailed information is provided in the CRM Appendix AnnexAppendixAnnex to the ES Offshore Ornithology Chapter (Volume 4, Annex 4-2: Offshore Ornithology – Collision Risk Modelling (Document Ref 6.4.4.2)).</p>
	<p>Sought that the assessment was carried out following the SNCB standard displacement approach with generic buffers applied for red-throated diver (4 km) and auks (2 km) and generic rates of displacement (100%).</p>	<p>The site based evidence from the construction and operation of the Thanet OWF was applied in the displacement assessment of red-throated diver and auks with the size of buffer and rate of displacement based on that evidence (Section 11).</p>
	<p>Noted that floating wind farm schemes in Scottish waters have not been included in Table 8.4.</p>	<p>The two floating wind schemes (Hywind and Kincardine) have been added in to Table 8.4.</p>
	<p>Noted that there has been no assessment of the potential in-combination effects of displacement on guillemot or razorbill.</p>	<p>Guillemot and razorbill were screened out because of the non-significant contribution to the in-combination effect, for instance <2 guillemot mortalities attributed to the Flamborough and Filey Coast pSPA (Section 8)</p>

5 Project Overview

5.1 Introduction

5.1.1 VWPL is proposing the development of Thanet Extension. The project will be located approximately 8 km offshore from the Kent coastline (at its closest point), in proximity to the operational TOWF. It would have a generation capacity of up to 340 MW. Up to 34 WTGs would be located in the array, an area approximately 73 km² in size. Electricity generated would be transported to the shore by offshore export cables installed within the proposed OECC to the landfall at Pegwell Bay, then through export cables installed within the proposed OCC to an onshore substation at Richborough, which will in turn connect to the existing National Grid substation (see Figure 1.1).

5.1.2 Full details on the project description are presented within the ES, specifically in Volume 2, Chapter 1: Offshore Project Description and Volume 3, Chapter 1: Onshore Project Description (Document Refs: 6.2.1 and 6.3.1 respectively). It is noted that for a number of aspects of the project, a range of options are available, particularly during the construction phase. To understand the potential for impact, and in line with both the Thanet Extension EIA and PINS Advice Note 9: Rochdale Envelope, the project elements that represent the maximum adverse scenario for each topic (the 'Rochdale Envelope') have been identified within each topic specific chapter of the EIA.

5.1.3 The information presented below is divided into the project description, which summarises the relevant information contained within the relevant ES chapters referenced above, followed by the maximum adverse scenario, as it applies here to the RIAA.

5.2 Project Description

5.2.1 Thanet Extension will comprise of WTGs and all infrastructure required to transmit the power generated by the WTGs to the national grid network via the grid connection location at Richborough. It will also comprise any onshore and offshore infrastructure required to operate and maintain the wind farm and associated infrastructure.

5.2.2 The key components of Thanet Extension are likely to include (noting the inclusion of 3 options for the onshore works – further detail on these is provided in Document Ref: 6.3.1, including further specifics on the design envelope for the cable corridor):

- Offshore WTGs (maximum of 34);
- OSS (if required);
- Met mast (if required);
- Foundations (for WTGs, and OSS and met mast if required);
- Subsea inter-array cables linking the individual WTGs;

- Subsea export cables from the wind farm to shore (up to four);
- Scour protection around foundations and on inter-array and export cables (if required);
- Cable landfall, where offshore cables are brought ashore;
- Up to four TJBs;
- Up to four onshore export cable circuits;
- One onshore substation at Richborough Port; and
- Up to two cables for the grid connection from the onshore substation to National Grid Electricity Transmission's (NGET) existing substation at Richborough Energy Park, comprising of up to six ducts (three per cable circuit) one duct per cable installed by Horizontal Directional Drilling (HDD). The final section of these cables will be trenched.

5.2.3 The onshore export cables will be buried for the majority of the onshore cable route, except in the Pegwell Bay Country Park (hereafter referred to as 'the Country Park'), where cables may be laid in an artificial berm above ground (in the case of Option 2) or trenched (Options 1 and 3).

5.2.4 The general wind farm site information is shown in Table 5.1 below, including the envelope within the three landfall options.

Table 5.1: General wind farm site information

Parameter	Maximum design envelope		
Total site area (array) (km ²)	73		
Total offshore export cable corridor area (km ²)	28		
Shortest distance from array area to shore (km)	8		
Site capacity (MW)	340		
Maximum number of WTGs	34		
Maximum number of OSSs	1		
Maximum number of met masts	1		
Onshore cable corridor (approximate length) (km)	2.6		
Maximum TJB size (m ²)	48		
Maximum no. of TJBs required	4		
Maximum construction space required for TJB compound (m ²)	192		
Temporary access route track width (m)	6		
Temporary access route track length (m)	Up to 350		
Design Envelope for the three landfall options	Option 1	Option 2	Option 3
Temporary works area (m ²)	50 x 60	30 x 40	30 x 40
Berm height of TJBs (m)	N/A	2.3	N/A
Berm height of onshore cable route within Country Park (m)	N/A	1.2	N/A
Maximum berm width of onshore cable route within Country Park (m) (assuming 1:5 gradient and subject to variation at footpath locations)	N/A	15.3	N/A
Length (assuming approximately north-south alignment) of cofferdam (m)	N/A	165	165

Seaward width of temporary cofferdam area (m)	N/A	25	25
Length (assuming approximately north-south alignment) of sea wall extension (m)	N/A	155	N/A
Seaward extension of permanent sea wall (m)	N/A	18.5	N/A
Maximum excavated material for TJBs (m ³)	1408	N/A	1408
Max area of saltmarsh area permanently removed (m ²)	N/A	1398.9	N/A

5.3 Consideration of Alternatives

5.3.1 Thanet Extension has been through an extensive process to determine final site selection and for consideration of alternatives. The process followed, together with the reasons behind the final project site selection and the alternatives considered (in terms of location and methods) is presented in full in Volume 1, Chapter 4: Site Selection and Alternatives (Document Ref: 6.1.4). Of note are the three remaining options for the onshore cable corridor – including options from landfall to the substation. These options remain in the maximum design envelope pending results of site investigation works, and the need to consider the potential release of contamination from the historic landfall.

5.3.2 The approach taken to site selection and alternatives has involved early engagement with stakeholders, together with a range of electrical, engineering, ecological and socio-economic appraisal studies. Stakeholders involved in the consultation process on site selection and alternatives are as follows:

- The Planning Inspectorate;
- Thanet District Council;
- Dover District Council;
- Kent County Council;
- The Environment Agency;
- Natural England;
- The Marine Management Organisation;
- The Kent Wildlife Trust;
- Cefas;
- Trinity House;
- Port of London Authority
- Utility Providers;

- Landowners;
 - Parish Councils; and
 - Members of the public through consultation events and scoping.
- 5.3.3 The PEIR (published November 2017) considered alternative routing options, together with alternative methods of construction, O&M and decommissioning, alongside different technologies and materials in order to assess, as far as possible the potential environmental effects. The information was revisited during the drafting of the ES (Volume 1, Chapter 4: Site Selection and Alternatives (Document Ref: 6.1.4)), resulting in the final scheme design described above. The lengthy process followed has allowed consultation at numerous intervals on project aspects such as site selection offshore, identification of cable corridors and landfall locations, routes taken for onshore components and methods of installation.
- 5.3.4 Key principles applied during the process can be summarised as follows:
- Shortest route preference for cable routing to minimise environmental impact, disturbance, cost and transmission losses;
 - Avoidance of key sensitive features where possible and where not, seek to mitigate impacts;
 - Minimise the disruption to populated areas; and
 - The need to accommodate the range of technology sought within the design envelope, and exclude those options outwith the envelope (i.e. ruling out overhead lines).
- 5.3.5 Site selection and alternatives has been specifically influenced by nature conservation considerations through the following:
- Offshore ornithological considerations during the delineation of the array RLB (specifically in relation to red-throated diver and the Outer Thames SPA);
 - Environmental considerations played a key role during the selection of the landfall/ substation location and cable route, with several locations/ routes considered and issues around designated sites taken into account during final landfall/ route selection, particularly aimed at minimising interaction with sensitive features such as designated bird species and habitats, with the relative risk in terms of designated sites considered for each option;
 - The array boundary has been trimmed in response to statutory consultation; and
 - The OECC has been reduced to align with the landfall location, with the area of overlap with the Thanet Coast SAC reduced.

5.4 Maximum Adverse Scenario

- 5.4.1 The 'worst-case' scenario, referred to throughout the EIA and here in the RIAA as the 'maximum adverse scenario', is applied here within the assessment of adverse effect. This approach ensures that the scenario that would have the greatest impact (e.g. largest footprint, longest exposure, or tallest dimensions, depending on the topic) is assessed; it can then be assumed that any other (lesser) scenarios will have an impact that is no greater than that assessed.
- 5.4.2 The Screening Report identified a number of receptor groups, with the topic specific maximum adverse scenario for each group presented within the relevant chapter from the ES, with those drawn on here. The receptor groups are outlined below, together with the relevant ES chapter and Table number.
- Table 5.10 from Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
 - Table 4.9 from Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4);
 - Table 7.14 from Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7); and
 - Table 5.10 from Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5).
- 5.4.3 The maximum adverse scenario, as it applies to each receptor group, is defined below in Table 5.2. For clarity regarding the differences between receptor groups, the information is presented according to individual project parameters, including a note regarding why the scenario is relevant to that receptor. Where relevant, the information includes any designed-in mitigation.

Table 5.2: Maximum project design scenario

Project Parameter	Receptor Group	Maximum design scenario assessed	Justification
Construction Parameter			
Direct disturbance within the subtidal arising from jack-up vessel operations	Subtidal benthic habitats	<p>For up to 34 WTGs, one Offshore Substation (OSS) and one meteorological mast (assuming six 'legs' per vessel and two jack up operations per WTG/ OSS/ met mast foundation installation; total disturbance of 471.24 m² per operation x 36 x 2 = 33,929 m²).</p> <p>For up to 34 WTGs, one Offshore Substation (OSS) and one meteorological mast (six anchors per foundation installation) operations per WTG/ OSS/ met mast foundation installation; total disturbance of 150 m² per operation x 36 = 5,400 m²).</p> <p>Temporary direct habitat disturbance = 39,329 m².</p> <p>Note that only a proportion of such disturbance may occur within a designated site.</p>	Volume 2, Chapter 5: Benthic Ecology (Document Ref: 6.2.5), Table 5.10
Direct disturbance within the subtidal arising from cable installation	Subtidal benthic habitats	<p>Temporary habitat disturbance of:</p> <ul style="list-style-type: none"> 64,000 m² from burial of 64 km of inter-array cables, by ploughing (10 m disturbance corridor); 30,600 m² from cable barge anchor placement associated with cable laying for inter-array cables – six anchors (footprint per anchor of 10 m²) with 15 anchoring operations per installation (6 x 10 m² x 15 x 34 inter-array cables = 30,600 m²); 1,440,000 m² from burial of 120 km of export cables (4 x 12 m width trenches of 30 km length) by ploughing 48,000 m² from cable pre-sweeping (dredging) (24 km x 20 m); and 34,560 m² from cable barge anchor placement associated with cable laying for export cables - six anchors (footprint of 10 m²) (6 x 10 m² x 144 operations per installation x 4 export cables = 34,560 m²). <p>Note that only a proportion of such disturbance may occur within a designated site.</p>	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct disturbance to subtidal potential habitats of conservation importance during cable installation	Subtidal benthic habitats	<p><i>Sabellaria spinulosa</i> reef is known to be present within the region, including inside the existing TOWF array area and has the potential to form within Thanet Extension proposed array area prior to construction.</p> <p>The maximum adverse scenario is associated with the installation of up to four export cables and inter-array cables for up to 34 WTGs.</p>	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct disturbance to the intertidal from cable installation operations, including in the saltmarsh	<p>Intertidal benthic habitats</p> <p>Onshore Biodiversity (in respect of birds only)</p>	<p>Four cable trenches will be installed across the intertidal, between Mean Low Water Spring (MLWS) and the edge of the saltmarsh. Trench width will be up to 10 m wide (28 m including spoil, based on a 30 degree slope), with burial up to 3 m below the seabed. Each cable will be separated by 5 m. A temporary access track of 6 m will also be utilised.</p> <p>Four trenches will be installed through the saltmarsh. Trenches will be 1 m wide, with 5 m either side to be used for vehicle movement and spoil. This will result in a maximum width of shoreline of 80 m. Under two of the three options under consideration for the landfall, a cofferdam will be installed around the section of sea wall that is being extended or opened for cable installation. The cofferdam will be 165 m</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p> <p>Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10</p>

		wide and 25 m in length. This will result in construction space (which includes the trench) in the saltmarsh totalling 7,376 m ² .	
Direct permanent habitat loss to saltmarsh	Intertidal benthic habitats Onshore Biodiversity (in respect of birds only)	Depending on the final option selected, the landfall works could involve extending the existing sea defence within the saltmarsh by up to 18.5 m over a length of up to 155 m. The total maximum area of permanent habitat loss as part of the landfall works is 1,399 m ² (0.0014 km ²) of saltmarsh habitat (0.13% of the total saltmarsh within the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar).	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10 Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10
Indirect disturbance from increased Suspended Sediment Concentrations (SSC) and associated sediment deposition arising from foundation installation and seabed preparation and cable installation	Subtidal and intertidal benthic habitats	Temporary increases in SSCs and sediment deposition as a result of: <ul style="list-style-type: none"> The installation of 30 suction caissons and associated seabed preparation works (seabed preparation volume per foundation = 9,600m³), resulting in 288,000 m³ of sediment dredged and deposited at the surface; Installation of 64 km of inter-array cable by jetting, to a depth of 3 m resulting in 96,000 m³ of sediment being displaced; Installation of 120 km of export cable by jetting, to a maximum depth of 3 m resulting in 1,740,000 m³ of sediment displaced; and Pre-sweeping, using a dredger, of 6 km of each export cable route for the purposes of sandwave clearance with all sediment disposed of in the water column along the cable route (1,440,000 m³). 	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct disturbance to terrestrial habitats due to construction of the TJBs, cable installation and construction of the substation	Onshore Biodiversity	<p>Terrestrial habitats including semi-improved and amenity grassland, scrub, hardstanding and ephemeral / short perennial communities will be subject to disturbance during construction works.</p> <p>A maximum of four TJBs will be constructed within Pegwell Bay Country Park, inland of the landfall location. These will have a combined footprint of up to 192 m² within a temporary works area of up to 3,000 m². A haul road of up to 350 m in length x 6 m in width would also be required. If the TJBs are constructed above-ground the TJBs themselves would be installed within a berm of maximum width 45m, which would be restored to grassland. The remainder of the area, including the haul road, would be reinstated to grassland (see Table 6.1).</p> <p>Up to 725 m of cabling will be required within Pegwell Bay Country Park, which will either be reinstated (if buried) or restored to grassland (if installed within a berm). The maximum width of the working corridor will be 30 m.</p> <p>350 m of cabling will be required within Stonelees Nature Reserve, which represents the only part of the onshore RLB forming part of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar. This will be buried and the affected area will be reinstated to grassland as soon as possible following cable installation (see Table 6.1). The maximum area within the SPA and Ramsar which could be affected is 10,500 m², i.e. 350 m length x 30 m width.</p> <p>To the south of Stonelees Nature Reserve a further 750 m of cabling will be required to reach the substation. This will largely be buried beneath hard standing and amenity grassland (sports pitches), which would be reinstated following completion of the works. Onward cabling between the substation and the National Grid will either be by HDD under the A256 or buried beneath existing roads and hardstanding, which would be reinstated upon completion.</p>	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10

Direct permanent loss of terrestrial habitats	Onshore Biodiversity	<p>Terrestrial habitats including scrub, broad-leaved woodland, scattered trees, semi-improved grassland, hardstanding, ephemeral/ short perennial communities may be permanently lost due to construction works. In addition at least one small, ephemeral water body may be lost within Stonelees Nature Reserve.</p> <p>Most of the semi-natural habitats to be lost will either be reinstated to grassland or restored to grassland (where cabling is installed within a berm) and any water bodies lost will be replaced. Approximately 2.4 ha of ephemeral/ short perennial habitat will be permanently lost during construction of the substation, although some of this will be restored following substation construction and approximately 0.4 ha of retained ephemeral/ short perennial habitat will be managed to increase its value (see Table 6.1).</p>	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10
Disturbance from increased noise, light and vibration from construction activities (noise/ light/ vibration/ visual).	Onshore Biodiversity	<p>Programme: Landfall: 5 months construction period and cabling up to 18 months construction period (excluding cable pulling). The total duration of the construction period may be up to a maximum of 30 months. There may be gaps in the construction programme where no works are undertaken.</p> <p>Noise: maximum construction noise levels are set out in Volume 3, Chapter 1, Project Description (Document Ref: 6.3.1). It is assumed that percussive piling may be required during installation of the landfall cofferdam and any cofferdam that may be required in Pegwell Bay Country Park to prevent the migration of contaminants if a buried solution is feasible (under landfall options 1 or 3). This would generate noise levels of up to 132 dB. Noise from percussive piling would be irregular in character and could last for a period of 33 days at each cofferdam.</p> <p>Lighting: most works would only take place between the hours of 07.00 and 19.00. Lighting would be restricted to lighting of working areas whilst works were taking place and there would be no requirement for lighting overnight, except for security lighting at the substation. 24-hour working may be required for HDD and for some works at the substation, e.g. during commissioning.</p>	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10
Indirect disturbance from increased noise and vibration from construction activities	Subtidal and intertidal benthic habitats	Installation of 36 monopiles (34 WTGs, one OSS and one met mast) using percussive piling at the maximum hammer energy of 5,000 kJ.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Indirect disturbance from increased SSC and sediment deposition in the intertidal	Intertidal benthic habitats	Installation of up to four export cables within the intertidal of two km per cable. Assumes a 10 m trench per cable with a maximum of 80,000 m ² of sediment positioned to the side of the trench.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct and indirect seabed disturbances leading to the release of sediment contaminants	Subtidal and intertidal benthic habitats	Seabed disturbance arising from installation of foundations and cables as described above for temporary increases in suspended sediments.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Change in air quality (dust)	Onshore Biodiversity	In accordance with IAQM (2014a) guidance dust impacts have been assessed for sensitive ecological receptors within 200 m of the Red Line Boundary or 200 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10 Volume 3 Chapter 9: Air Quality, Table 9.15 (Document Ref: 6.3.9)
Accidental pollution	Onshore Biodiversity	Pollution of water-based resources from the above construction activities. In the absence of mitigation works at the landfall construction could create pathways for the migration of potential contaminants from	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10

		the landfill. Works could take place within/ across areas with potentially contaminated soils and groundwater (subject to the findings of planned Site Investigation works).	
Indirect disturbance arising from the accidental release of pollutants	Subtidal and intertidal benthic habitats	Synthetic compound, heavy metal and hydrocarbon contamination resulting from offshore infrastructure installation and a maximum of 1,160 round trips to port by construction vessels over the construction period. Water-based drilling muds associated with drilling to install foundations, should this be required. Potential contamination of intertidal habitats resulting from machinery use and vehicle movement.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Construction activities: Underwater Noise	Marine mammals	<p>WTG:</p> <ul style="list-style-type: none"> • Maximum site capacity 340 MW; • Maximum one piling operation at any one time (single vessel piling only); • Maximum piling period expected to be six working months in total, phased over a 28 month period. <p>Worse-case (spatial extent, largest impact footprint): Pile-driving of all foundations (RIAA assuming up to a maximum of 36 foundations in total, with the ES worst-case assuming 28 WTG as these would be 12+ MW turbines with the largest pile diameter):</p> <ul style="list-style-type: none"> • Max pile diameter 10 m; • Maximum hammer driving energy 5,000 kJ; • Soft start – starting hammer energy 250 kJ; • Soft start duration one hour; • Soft start 15 blows per minute; • Maximum 30 blows per minute; • Average 20 blows per minute; • Maximum 8,000 blows per foundation; and • Maximum piling time per foundation (assuming issues such as low blow rate, refusal etc) six hours. <p>Worst-case (temporal extent, longest duration of piling): Pile-driving of quadropod jacket foundations (RIAA assuming up to a maximum of 36 foundations, with the ES worst-case assuming 34 WTG as these would be 10 MW turbines):</p> <ul style="list-style-type: none"> • Four piles per foundation; • Maximum pile diameter 3 m; • Maximum hammer driving energy 2,700 kJ; • Soft start starting hammer energy 270 kJ; • Soft start duration one hour; • Soft start 15 blows per minute; • Maximum 30 blows per minute; • Average 30 blows per minute; • Maximum 8,400 blows per foundation; and • Maximum piling time per foundation (assuming issues such as low blow rate, refusal, etc) 8 hours. <p>OSS:</p> <ul style="list-style-type: none"> • Maximum one OSS; • Monopile or tripod foundation; 	Volume 2, Chapter 7, Marine Mammals (Document Ref: 6.2.7), Table 7.14

		<ul style="list-style-type: none"> • Maximum pile diameter 10 m for monopile, 3 m for tripod; • Maximum hammer driving energy 2,700 kJ; • Soft start starting hammer energy 270 kJ; • Soft start duration 0.33 hours; • Soft start 20 blows per minute; • Maximum 30 blows per min; and • Maximum piling time per foundation (assuming issues such as low blow rate, refusal, etc) six hours. <p>Cable installation (export and array cables)</p> <ul style="list-style-type: none"> • Cable will be buried using ploughing, trenching, jetting, cutting, mass flow excavation or pre-sweeping (or combination); • 25% of cable route may require additional protection (e.g. rock dumping or mattresses); and • At closest point, export cable corridor route is 1.5 km from known seal haul-out locations in Goodwin Sands. There are potential seal haul-out areas within the export cable corridor route and landfall in Pegwell Bay. 	
UXO clearance	Marine mammals	<p>The following has been assumed:</p> <ul style="list-style-type: none"> • 30 UXOs • Clearance dates: 2019 at the earliest (with 2020 being more likely) • Number UXO clearances/ day: up to 8, requiring up to 8 days • Charge weights: between 0.05 and 130 kg (with a soft start approach involving scare charges for weights 130 kg) 	Volume 2, Chapter 7, Marine Mammals (Document Ref: 6.2.7), Table 7.14
Vessel Interactions: Disturbance and collision risk	Marine mammals	<p>Worst-case:</p> <p>A maximum of 48 vessels may be in operation onsite during the construction phase for construction (although unlikely that all will be onsite at the same time):</p> <ul style="list-style-type: none"> • Three seabed preparation vessels; • Two transition piece installation vessels; • Six scour installation vessels; • Five vessels engaged in foundations; • Six WTG installation vessels; • Seven commissioning vessels; • One accommodation vessel; • Four IA cable vessels; • Six export cable vessels; • Two landfall cable installation vessels; • Three substation/ collector IV; and • Three other vessels. <p>1,268 round trips to port for 340 MW project over 3 years.</p>	Volume 2, Chapter 7, Marine Mammals (Document Ref: 6.2.7), Table 7.14

<p>Changes in water quality: Increased suspended sediments arising from construction activities with the potential to affect the foraging ability of marine mammals</p>	<p>Marine mammals</p>	<p>Foundations: Seabed preparation for 30 quadropod suction caisson foundations (28 turbine foundations, one OSS and one met-mast (9,600 m³ each)), resulting in 288,000 m³ of sediment being dredged and re-deposited.</p> <p>Cable installation: Installation of 64 km of inter-array cable by jetting, to a maximum depth of 3 m resulting in 96,000 m³ of sediment being displaced (v-shaped trench width of 1 m and 50% of sediment in the trench being liquidised); Installation of 120 km of export cable by jetting, to a depth of 3 m resulting in 180,000 m³ of sediment being displaced (v-shaped trench, width of 1 m and 50% of sediment being liquidised); and Pre-sweeping, assuming 20% of the export cable route requires pre-sweeping and 60 m³ of sediment is swept per metre, resulting in 1,440,000 m³ of sediment being dredged and re-deposited.</p> <p>Total: Maximum volume of displaced sediment of up to 1,944,400 m² of sediment.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>
<p>Loss of prey resources from changes in benthic habitats and/or changes in the fish and shellfish community from impacts during construction</p>	<p>Marine mammals</p>	<p>The maximum adverse design scenario for the fish and shellfish ecology assessment is presented in Volume 2, Chapter 6: Fish and Shellfish.</p> <p>The maximum adverse design scenario for the Benthic habitats is presented in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology</p>	<p>Volume 2, Chapter 7: Marine Mammals Ecology (Document Ref: 6.2.7), Table 7.14</p>
<p>WTG</p>	<p>Offshore Ornithology</p>	<p>No more than one foundations/ towers/ nacelles/ blades are installed at any one time.</p> <p>Number and diameter of turbines in relation to collision risk addressed in operational section of this table.</p>	<p>Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4), Table 4.9</p>
<p>Array cables and OECC</p>	<p>Offshore Ornithology</p>	<p>Cable laying is carried out by six specialist vessels for export cables.</p> <p>Cable laying is carried out by four specialist vessels for inter-array cables.</p> <p>The cable laying operation is not restricted to any period of the year.</p>	<p>Table 4.9 of Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4)</p>
<p>Landfall</p>	<p>Offshore Ornithology</p>	<p>Installation of cable at landfall is carried out by two specialist vessels.</p> <p>The installation of cable at landfall can only occur in April to September inclusive.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>
<p>Seabed preparation</p>	<p>Offshore Ornithology</p>	<p>Temporary increases in SSCs and sediment deposition as a result of:</p> <ul style="list-style-type: none"> • The installation of 30 suction caissons and associated seabed preparation works (seabed preparation volume per foundation = 9,600m³), resulting in 288,000 m³ of sediment dredged and deposited at the surface; • Installation of 64 km of inter-array cable by jetting, to a depth of 3 m resulting in 96,000 m³ of sediment being displaced; • Installation of 120 km of export cable by jetting, to a maximum depth of 3 m resulting in 180,000 m³ of sediment displaced; and • Pre-sweeping, assuming 20% of the export cable route requires pre-sweeping and 60 m³ of sediment is swept per metre, resulting in 1,440,000 m³ of sediment being dredged and re-deposited. <p>Total: Maximum volume of displaced sediment of up to 1,944,400 m² of sediment.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>

Offshore structures	Offshore Ornithology	Minimum spacing of 716 x 480 m between WTGs, 1 OSS and 1 met mast.	Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4), Table 4.9
Vessel activities	Offshore Ornithology	Up to 48 vessels in operation on site at the same time.	Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4), Table 4.9
O&M			
Habitat loss of seabed habitat through presence of foundations, scour protection and cable protection	Subtidal benthic ecology	<p>The maximum adverse scenario for long-term habitat loss also includes the use of cable protection (i.e. rock placement or concrete mattresses) along 25% of the export cable (30,000 m x 7 m = 210,000 m²). Up to 80,000 m² export cable crossings.</p> <p>Up to 1,256 m² per foundation footprint for the 12 MW WTGs (area of 20 m diameter buckets x four legs), one OSS and one met mast on quadropod suction bucket foundations (30 x 1,256m² = 37,680 m²). A further 7,854 m² area is predicted to be lost per foundation to prevent scour protection for the 28 WTGs (12 MW), one OSS and one met mast (7,854 m² x 30 foundations = 235,260 m²).</p> <p>80,000 m² inter-array cable protection for unburied cable (25% of the maximum 64 km), 12,000 m² array cable crossings, and 17,500 m² for inter-array cable protection approaching turbine foundations (50 m x 5 m x 70 (2 x 35 (foundation number (excluding the met mast)))).</p> <p>Long-term total habitat loss of: 0.68 km².</p>	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct introduction and subsequent colonisation of hard substrate (WTGs/ scour protection/ cable protection) may affect benthic ecology and biodiversity	Subtidal benthic ecology	Total area of introduced hard substrate: 0.68 km ²	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Permanent loss of saltmarsh habitat at landfall	Intertidal benthic ecology	Permanent loss of saltmarsh from an extension of the seawall seawards of a curved structure (155 m x 18.5 m). For worst-case this will result in loss of 1,399 m ² (0.0014 km ²) loss of saltmarsh habitat (0.13% of the saltmarsh within the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar).	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10

<p>Direct disturbance to the seabed arising from maintenance operations (use of jack-up vessels, inspection of cables and foundations, repair of subtidal cables)</p>	<p>Subtidal and intertidal benthic ecology</p>	<p>Temporary habitat loss/ disturbance from up to 342 jack-up visits over the 30⁶ year lifetime of the project.</p> <p>Preventative maintenance of subsea cables including routine inspections to ensure the cable is buried to an adequate depth and not exposed. The integrity of the cable and cable protection system (i.e. bending restrictors and bend stiffeners where used) will also be inspected. Maintenance works to rebury/ replace and carry out repair works on subsea cables should this be required and the associated increase in SSC and sediment deposition arising from these repair and replacement works.</p> <p>A worst-case assumption for the entire export cable corridor of one failure per cable every 5 years, requiring repair through removal of 300 m of cable, with a disturbance width of 10 m and a total area of reburial of 3,000 m².</p> <p>No substantive maintenance work is expected to be required to the intertidal cables. Temporary disturbance in the intertidal from periodic will arise from preventative maintenance work, including geophysical investigations. The most likely scenario is that there would be planned yearly inspections of all cables within the intertidal, combined with 'unscheduled' inspections following extreme events (e.g. large storm events). The inspections are likely to comprise two or three persons accessing the intertidal on foot or small 4 wheel drive vehicle (use of low pressure vehicles such as an ARGO Cat or the use of hovercraft will also be considered) for a duration of approximately two to three weeks.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p> <p>Volume 2, Chapter 1: Project Description (Offshore) (Document Ref: 6.2.1), Table 1.33</p>
<p>Indirect disturbance arising from electromagnetic fields generated by the current flowing through the cables buried to less than 1.5 m below the surface.</p>	<p>Subtidal benthic ecology</p>	<p>Up to 64 km of inter-array cable connecting 34 WTGs operating at 66 kilovolts (kV) and up to 120 km of export cable (four cables of approximately 30 km length each) operating at up to 220 kV buried less than 1.5 m below the surface.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>
<p>Indirect disturbance leading to alterations of seabed habitats arising from scour effects and changes in the sediment and wave regime</p>	<p>Subtidal benthic ecology</p>	<p>The greatest changes to the tidal and wave regimes and the sediment transport in the array arise from the use of the 12 MW suction bucket caisson foundations and the use of the maximum volume of cable protection and 80 cable crossings, using concrete mattresses.</p> <p>Scour effects are assessed within the Marine Geology, Oceanography and Physical Processes Technical Annex (Volume 4, Annex 2-1).</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>
<p>Indirect disturbance arising from the accidental release of pollutants</p>	<p>Subtidal benthic ecology</p>	<p>Synthetic compound, heavy metal and hydrocarbon contamination resulting from up to 34 WTGs, one OSS and one met mast. Accidental pollution may also result from up to 307 round-trips to port by O&M vessels (including crew supply vessels and jack-up vessels) per year over the 30-year design lifetime.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>

⁶ The operational life is expected to be 30 years, although may be extended as the project nears decommissioning, as technology/ maintenance improves

		<p>A typical 12 MW WTG is expected to contain approximately 2,000 litres of grease, 2,000 litres of synthetic or hydraulic oil, 200 litres of liquid nitrogen, 2,000 kg of silicone oil and 100 kg SF6 gas.</p> <p>The OSS is expected to contain approximately 200,000 litres of diesel, 1,000 litres of grey water, 1,000 litres of black water, 600,000 litres of transformer coolant water, 10 litres of UPS batteries, 20,000 litres of fire suppressant material, 1,500 kg of SF6, 5 m³ of engine oil and 5 m³ of HVAC coolant (glycol).</p>	
Accidental pollution.	Onshore Biodiversity	<p>Potential contamination of intertidal and terrestrial habitats resulting from machinery use and vehicle movement is possible during O&M.</p> <p>Onshore, planned maintenance is likely to be restricted to weekly visits to the substation, up to eight checks of joint pits per year and annual checks of TJBs, all of which will take place for the lifetime of the wind farm (40 years). These checks would involve the use of up to two people and a light vehicle only, with up to two HGV visits to the substation also required each month.</p> <p>Planned maintenance in the intertidal zone will include periodic preventative maintenance work, including geophysical investigations. The most likely scenario is that there would be planned yearly inspections of all cables within the intertidal, combined with 'unscheduled' inspections following extreme events (e.g. large storm events). The inspections are likely to comprise two or three persons accessing the intertidal on foot or small four wheel drive vehicle (use of low pressure vehicles such as an ARGO Cat or the use of hovercraft will also be considered) for a duration of approximately two to three weeks.</p> <p>The extent or nature of any corrective maintenance required can't be predicted at this stage and therefore possible effects in terms of accidental pollution can't be assessed. Any corrective maintenance required would be subject to any necessary consents and consultation with the relevant nature conservation bodies.</p>	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10
Disturbance due to O&M activities (noise/ light/ vibration/ visual).	Onshore Biodiversity	<p>During normal operation noise will only be generated by the substation, at a level of 90 dB (regular noise). There will be no lighting or visual disturbance during normal operation. Disturbance is possible during planned and corrective maintenance – see above regarding accidental pollution for maximum design scenario assessed.</p>	Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10
Vessel Interactions: disturbance and collision risk	Marine Mammals	<ul style="list-style-type: none"> • 300 small CTV O&M vessels • Two large O&M vessels • One lift vessel • One cable maintenance vessel • One auxiliary vessel <p>Total of 307 vessel round trips to port per year, per vessel (mostly small O&M vessels)</p>	Volume 2, Chapter 7: Marine Mammals Ecology (Document Ref: 6.2.7), Table 7.14
Subsea Operational noise	Marine Mammals	<p>Up to 34 x 10 MW WTGs operating over a lifetime of 30 years.</p>	Volume 2, Chapter 7: Marine Mammals Ecology (Document Ref: 6.2.7), Table 7.14
Change in prey resources resulting from changes in benthic habitats and/ or changes in the fish and shellfish	Marine Mammals	<p>The maximum adverse design scenario for the fish and shellfish ecology assessment is presented in Volume 2, Chapter 6: Fish and Shellfish.</p> <p>The maximum adverse design scenario for the Benthic habitats is presented in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology</p>	Volume 2, Chapter 7: Marine Mammals Ecology (Document Ref: 6.2.7), Table 7.14

community from impacts during operation			
WTG	Offshore Ornithology	34 x 10 MW WTGs	Volume 2, Chapter 4: Offshore Ornithology (Document Ref 6.2.4), Table 4.9
Vessel activities	Offshore Ornithology	<ul style="list-style-type: none"> • 300 small CTV O&M vessels • Two large O&M vessels • One lift vessel • One cable maintenance vessel • One auxiliary vessel Total of 307 vessel round trips to port per year, per vessel (mostly small O&M vessels)	Volume 2, Chapter 4: Offshore Ornithology (Document Ref 6.2.4), Table 4.9
Decommissioning			
Direct disturbance due to operations to remove foundations, inter-array cables, export cables (including use of jack-up vessels)	Subtidal and intertidal benthic ecology	Total subtidal temporary habitat loss = 556,071.6 m ² ; and Total intertidal temporary habitat loss = 80,000 m ² . Assuming disturbance from cable removal results in 3 m wide disturbances and one jack-up vessel operation is required for the removal of each piece of wind farm infrastructure (i.e. each WTG or the OSS or the met mast). Export cable disturbance: 120 km x 3 m = 360,000 m ² (0.360 km ²) Inter-array cable disturbance: 64 km x 1 m = 64,000 m ² (0.064 km ²) Jack-up vessel footprint: 5,400m ² per jack-up operation x 36 (34 WTGs, one OSS and one met mast) = 39,329 m ²	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Indirect disturbance from increased SSC and associated sediment deposition from removal of foundations, inter-array cables and export cables	Subtidal and intertidal benthic ecology	Increases in suspended sediment and associated sediment deposition from the removal of up to 36 foundations (i.e. 34 WTGs, one OSS and one met mast) and 194 km of inter-array and export cable.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct and indirect seabed disturbances leading to the release of sediment contaminants	Subtidal and intertidal benthic ecology	As above for construction impacts.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct loss of species and habitats from the removal of foundations	Subtidal benthic ecology	Maximum surface area of 1,257 m ² per foundation provided by suction bucket foundations for 28 WTGs, one OSS and one met mast.	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10
Direct permanent loss of habitat due to presence of scour and cable protection left <i>in situ</i> post-decommissioning	Subtidal benthic ecology	Permanent habitat loss of: 0.68 km ²	Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10

<p>Indirect disturbance arising from the accidental release of pollutants</p>	<p>Subtidal and intertidal benthic ecology</p>	<p>Synthetic compound, heavy metal and hydrocarbon contamination resulting from a maximum of 34 WTGs, one OSS and one met mast, together with necessary round trips to port for decommissioning vessels over the decommissioning period.</p> <p>Potential contamination in the intertidal resulting from machinery use and vehicle movement.</p>	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p>
<p>Direct temporary habitat loss to the intertidal and saltmarsh from cable removal operations</p>	<p>Intertidal benthic ecology Onshore Biodiversity (in respect of birds only)</p>	<p>The impacts and thus resultant effects for decommissioning, are expected to be similar to construction (see above), but over a slightly reduced timescale, and with a lower requirement for land take, since the assets are already <i>in situ</i>, resulting in a possible maximum 80,000 m² temporary loss of intertidal habitat. The programme for decommissioning is expected to be similar in duration to the construction phase. Any final decommissioning methodology would adhere to industry best practice, rules and regulations at the time of decommissioning. No permanent land take would result. The detailed activities and methodology for decommissioning will be determined later within the project lifetime, but worst-case would be expected to include:</p> <ul style="list-style-type: none"> • Dismantling and removal of electrical equipment; • Removal of cabling from site where required (it is expected some would be cut and left <i>in situ</i>); • Removal of any building services equipment; • Demolition of the buildings and removal of fences; and • Landscaping and reinstatement of the site. 	<p>Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5), Table 5.10</p> <p>Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10</p>
<p>Direct disturbance to terrestrial habitats from decommissioning activities</p>	<p>Onshore Biodiversity</p>	<p>Some disturbance to terrestrial habitats is likely during decommissioning, similar to during construction. The area affected is expected to be considerably smaller than during construction however since the assets are already <i>in situ</i> and some assets would remain <i>in situ</i> (e.g. TJBs, cable ducts, etc). Any final decommissioning methodology would adhere to industry best practice, rules and regulations at the time of decommissioning.</p>	<p>Volume 3, Chapter 5: Onshore Biodiversity, (Document Ref: 6.3.5), Table 5.10</p>
<p>Disturbance from decommissioning activities. (noise/ light/ vibration/ visual).</p>	<p>Onshore Biodiversity</p>	<p>Disturbance effects during decommissioning are expected to be similar to construction (see above) but with a smaller area affected since the assets are already <i>in situ</i> and some assets would remain <i>in situ</i>. Any final decommissioning methodology would adhere to industry best practice, rules and regulations at the time of decommissioning.</p>	<p>Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10</p>
<p>Accidental pollution (including dust pollution)</p>	<p>Onshore Biodiversity</p>	<p>Potential contamination of intertidal and terrestrial habitats is possible during decommissioning as during construction (see above), but with a smaller area affected since the assets are already <i>in situ</i> and some assets would remain <i>in situ</i>. Any final decommissioning methodology would adhere to industry best practice, rules and regulations at the time of decommissioning.</p>	<p>Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5), Table 5.10</p>
<p>Impacts from decommissioning</p>	<p>Marine Mammals</p>	<p>Impacts from decommissioning are expected to be similar to those listed above for construction, if project infrastructure is removed from the seabed at the end of the development's operational life. If it is deemed closer to the time of decommissioning that removal of certain parts of the development (e.g. cables) would have a greater environmental impact than leaving <i>in situ</i>, it may be preferable to leave those parts <i>in-situ</i>. In this case, the impacts would be similar to those described for the operational phase.</p>	<p>Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7), Table 7.14</p>
<p>Impacts from decommissioning</p>	<p>Offshore Ornithology</p>	<p>Impacts from decommissioning are expected to be similar to those listed above for construction.</p>	<p>Volume 2, Chapter 4: Offshore Ornithology (Document Ref 6.2.4), Table 4.9</p>

5.5 Construction Programme

5.5.1 A high level indicative programme of relevant works is presented in Table 5.3 below, illustrating the main project infrastructure elements and the duration within which construction will occur. Overall, offshore construction is scheduled to commence in 2021 and lasting for up to 28 months, with pre-construction works required prior to that period (potentially including geophysical survey and clearance of UXO), these occurring from 2019 onwards (more likely to be 2020). Onshore construction is scheduled to occur within the period September 2020 to February 2023, requiring an indicative 30 months in total. It should be noted that there is a seasonal restriction for works in the intertidal and at the shoreline, as provided for in section 6 (Embedded Mitigation), which ensures no works within the intertidal area or at the shoreline during the period October to March inclusive.

Table 5.3: Indicative Constructive Programme

Construction Activity	Indicative construction date/period
Foundation installation	Within the period Q1 2021-Q2 2023 Total duration of approximately 6 months (including 1 month weather downtime)
Inter-array and cable export installation	Within the period Q1 2021-Q2 2023 Total duration of approximately 6 months (including 1 month weather downtime)
OSS (if required)	Within the period Q1 2021-Q2 2023 Total duration of approximately 2.5 months (including 2 weeks for foundation installation and weather downtime)
Met mast (if required)	Within the period Q1 2021-Q2 2023 Total duration of approximately 2.5 months (including 2 weeks for foundation installation and weather downtime)
WTG installation	Within the period Q1 2021-Q2 2023 Total duration of approximately 6 months (including 1 month weather downtime)
Scour protection	Within the period Q1 2021-Q2 2023 Total duration of approximately 1 month (including 2 weeks weather downtime)
Landfall works (including TJBs)	Indicative Q1 2021 – Q3 2021 subject to seasonal constraints Total duration of 5 months
Onshore cable circuits	Q1 2021 – Q2 2022 Total duration of 18 months (not including cable pulling and jointing)
Substation works	Q3 2020 – Q2 2022 Total duration of 24 months
NGET grid connection works	Q2 2021 – Q3 2022 Total duration of 3 months

5.6 Operation, Maintenance and Decommissioning Programme

- 5.6.1 Full details of the operation, maintenance and decommissioning programme is available in Volume 2, Chapter 1: Project Description (Offshore) and Volume 3, Chapter 1: Project Description (Onshore) (Document Refs: 6.2.1 and 6.3.1 respectively), with a summary provided here.
- 5.6.2 Thanet Extension is expected to be fully constructed within 2023, including testing and commissioning. The offshore operation life is expected to be 30 years, and onshore expected to be 40 years, following commissioning. Once the site is operational, the O&M phase begins; the schedule for O&M will be agreed via the O&M strategy, which will be finalised once the technical specifications are known. Decommissioning will follow the O&M phase; a decommissioning plan and programme would be required to be submitted prior to the construction of Thanet Extension.
- 5.6.3 The operation and control of Thanet Extension would be managed by a Supervisory Control and Data Acquisition (SCADA) system, connecting each WTG to the onshore control room. The SCADA system would enable the remote control of individual WTGs, the wind farm in general, as well as remote interrogation, information transfer, storage and the shutdown or restart of any WTG if required.
- 5.6.4 O&M activities will take place from the existing hub in Ramsgate. Maintenance activities can be categorised into two levels: preventative and corrective maintenance. Preventative maintenance is according to scheduled services whereas corrective maintenance covers unexpected repairs, component replacements, retrofit campaigns and breakdowns.
- 5.6.5 The O&M will be both preventative and corrective. The offshore O&M strategy will include an onshore (harbour based) O&M base at the existing hub in Ramsgate. Due to the proximity of the wind farm to the shore, it is unlikely that a Special Operations Vessel (SOV) would perform the function of an offshore accommodation base. The general O&M strategy may rely on Crew Transfer Vessels (CTVs), supply vessels, and helicopters for the O&M services that will be performed at the wind farm.
- 5.6.6 Onshore, the O&M requirements will be largely corrective, accompanied by infrequent on-site inspections of the onshore transmission infrastructure. However, the onshore infrastructure will be consistently monitored remotely, and there may be O&M staff visiting the onshore substation to undertake works on a regular basis (expected to be once per week). The onshore substation will not be manned, and lighting will only be required during O&M activities. Lighting will be required at the NGET connection at REP, although this is assumed to be existing. Periodic access to link boxes and test pits may also be required for inspection, estimated to be annually.
- 5.6.7 Worst-case O&M estimates are provided in the project descriptions chapters; Document Refs: 6.2.1 and 6.3.1. Relevant consents or licenses would be applied for if required during the O&M phase.

- 5.6.8 The scope of the decommissioning works onshore and offshore would be determined by the relevant legislation, policy and guidance at the time of decommissioning, but would most likely involve the removal of accessible installed components. Offshore this is likely to include; all of the WTG components, part of the foundations (those above seabed level) and the sections of the inter-array cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. Onshore, it is likely that the onshore cables will be removed from the ducts and recycled, with the transition pits and ducts capped and sealed then left *in situ*.
- 5.6.9 The DCO includes a requirement on the project for an offshore decommissioning plan to be submitted to the SoS for BEIS under the Energy Act (2004) prior to construction. Any such plan would be updated at the time of decommissioning according to changing best practice and new technologies.

6 Embedded mitigation

- 6.1.1 The information on embedded mitigation per receptor draws on individual topic chapters and (if relevant and appropriate) mitigation specific to the RIAA. All embedded mitigation relevant to the RIAA is summarised below in Table 6.1 including the route for securing each mitigation measure. The determination of potential for adverse effect is made incorporating the embedded mitigation within the design scenario assessed.
- 6.1.2 As highlighted in Section 2 above, following the Sweetman II ruling, mitigation included within the project specifically in relation to a relevant site (ie a site being considered within the RIAA) cannot be taken into account during screening for LSE but remains relevant for consideration of adverse effect. Where project mitigation forms part of the project (or would be legally required by the project regardless of the content of the RIAA, for example standard pollution control measures), such mitigation remains in consideration during the determination of LSE. All the mitigation presented below in Table 6.1 is taken into consideration during determination of adverse effect.

Table 6.1: Embedded mitigation

Mitigation measures embedded into the project design	Relevant for Screening of LSE?	Aim of the mitigation	Mechanism for Securing Mitigation
Subtidal and benthic intertidal habitats			
Definition of development boundaries	No – forms part of the project design	The development boundary selection was made following a series of constraints analyses, with the array area and OECC route selected to ensure the impacts on the environment and other marine users are minimised.	DCO
To address direct impacts during construction on benthic habitats of conservation importance	No – taken into account in the assessment of AEoI	<p>Although habitats of conservation importance have not been identified in the baseline surveys, biogenic reef has been identified during the TOWF pre- and post-construction surveys and are known to be present in this area. Therefore, pre-construction surveys will be undertaken to identify any areas of core reef, which will then be micro-sited around to avoid impacts. A biogenic reef mitigation plan will be developed and agreed with the relevant stakeholders prior to construction. Biogenic reefs are not a designated feature of any of the sites considered within the RIAA. However, the mitigation plan is relevant here with respect to chalk reefs (geogenic reef). Should any chalk reefs be identified during these preconstruction surveys, then chalk reef would similarly be included within the biogenic reef mitigation plan, with micro siting to avoid direct impact.</p> <p>An ECoW will oversee the construction works in the intertidal area to ensure that impacts do not exceed those described within this assessment.</p> <p>A Phase 1 walkover survey will also be undertaken of the intertidal area prior to construction to provide an up-to-date assessment and delineation of sensitive habitats present and ensure that impacts to the intertidal area do not exceed those within this assessment. This will feed into the Saltmarsh Mitigation and Reinstatement Plan that will be produced as part of the application.</p>	DCO
Pollution prevention	No – forms part of the project design	<p>A Project Environment Management Plan (PEMP) will be produced post consent and followed to cover the construction and O&M phases of Thanet Extension. The PEMP will incorporate plans to cover accidental spills, potential contaminant release and include key emergency contact details (e.g. MMO, Maritime Coastguard Agency (MCA) and the project site coordinator). A Decommissioning Programme will be developed to cover the decommissioning phase.</p> <p>Typical measures will include: only using chemicals approved by Cefas under the Offshore Chemicals Regulations 2002; storage of all chemicals in secure designated areas with impermeable bunding (generally to 110% of the volume); and double skinning of pipes and tanks containing hazardous materials. The purpose of these measures ensures that potential for contaminant release is strictly controlled and therefore provides protection to ecology across all phases of the life of the wind farm.</p>	DCO
Electromagnetic Frequency (EMF)	No – taken into account in the assessment of AEoI	Inter-array and export cables will be buried to a maximum target depth of 3 m, subject to a cable burial risk assessment. Where it is not possible to bury the cables sufficiently, cable protection will be used. While cable protection or burial does not decrease the strength of EMF at source, it does increase the distance between the cables and benthic receptors, thereby reducing the received EMF (from attenuation of the EMF) and potentially reducing the effect on those receptors.	DCO
Marine Mammals			

Mitigation measures embedded into the project design	Relevant for Screening of LSE?	Aim of the mitigation	Mechanism for Securing Mitigation
Pile driving WTG	No – taken into account in the assessment of AEoI	<p>Monopiles: A one hour soft-start (during which the hammer energy will gradually be ramped up from approximately 10% energy to maximum over a period of approximately one hour) will be used for all piling activities. Piling will commence at a maximum of 200 kJ (8 and 10 MW WTG) or 250 kJ (12+ MW WTG) hammer energy. Hammer energy will ramp up to full hammer energy of 4,000 kJ (8 and 10 MW WTG) or 5,000 kJ (12+ MW WTG). The strike rate will increase from 15 blows per minute during the soft start to a maximum of 30 blows per minute during full piling.</p> <p>Quadropod jacket: A one hour soft-start will be used for all piling activities. Piling will commence at a maximum of 270 kJ. Hammer energy will ramp up to full hammer energy of 2,700 kJ. The strike rate will increase from 15 blows per minute during the soft start to a maximum of 30 blows per minute during full piling.</p>	Included in the draft MMMP secured by dML
Pile-driving OSS and met mast (if required)	No – taken into account in the assessment of AEoI	A one hour soft-start will be used for all piling activities. Piling will commence at a maximum of 270 kJ hammer energy. Hammer energy will ramp up to full hammer energy of 2,700 kJ. The strike rate will increase from 20 blows per minute during the soft start to a maximum of 30 blows per minute during full piling. This is the same irrespective of the foundation type (monopile, tripod or quadropod).	Included in the draft MMMP secured by dML
All pile-driving	No – taken into account in the assessment of AEoI	Following JNCC (2010) guidelines, a Marine Mammal Mitigation Plan will be produced and followed to cover the construction phase. This will outline the soft-start procedure, monitoring, and any other agreed mitigation options deemed necessary, to reduce to negligible levels the potential risk of injury or death to marine mammals in close proximity to piling operations.	Included in the draft MMMP secured by dML
UXO clearance	No – taken into account in the assessment of AEoI	The exact details of the mitigation required during UXO detonation will be agreed at such time as detailed information is available on the location, number and size of the detonations required. However it is likely that any UXO-MMMP will include visual monitoring of a mitigation search zone to be conducted for one hour, followed by the deployment of Acoustic Deterrent Devices (ADDs) for 40 minutes prior to the detonation of any UXO. Where practicable and safe to do so after a specific dynamic Risk Assessment, a ‘soft-start approach’ may be conducted before detonation of any UXO 130 kg or over, which involves the detonation of three small charges of 50 g, 100 g and 150 g spaced at five minute intervals with a further five minutes before the main UXO is detonated.	To be included in a UXO-MMMP as required
Pollution prevention	No – forms part of the project design	A PEMP will be produced post consent and followed to cover the construction and O&M phases. This will also incorporate plans to cover accidental spills, potential contaminant release and include key emergency contact details (e.g. MMO, Maritime and Coastguard Agency (MCA) and the project site co-ordinator). A decommissioning programme will be developed to cover the decommissioning phase. The purpose of the measures to be implemented ensure that potential for contaminant release is strictly controlled and therefore provides protection to marine life across all phases of the life of the project.	DCO
EMF	No – taken into account in the assessment of AEoI	Cable burial to a minimum target depth of 1 m (subject to risk assessment) will increase the distance between cables and benthic receptors, thereby reducing the strength of the received EMF.	DCO

Mitigation measures embedded into the project design	Relevant for Screening of LSE?	Aim of the mitigation	Mechanism for Securing Mitigation
Decommissioning	No – taken into account in the assessment of AEoI	Embedded mitigation measures implemented in the Decommissioning Phase are likely to be similar to those implemented during the construction phase.	DCO
Offshore Ornithology			
Red-throated diver, interest feature of Outer Thames Estuary SPA	No – forms part of the project design	The original (pre-scoping) site boundary was reduced in size to ensure that the nearest WTG was separated by 4 km to the Outer Thames Estuary SPA.	Part of array layout described in DCO.
Onshore Biodiversity			
Project design	No – forms part of the project design	Careful routeing of the onshore cable route to avoid key areas of sensitivity, with the onshore RLB avoiding Sandwich Bay SAC.	Project design process
Project design	No – forms part of the project design	Aim to minimise the land take for works where reasonably practicable and locate (and micro-site within the red line boundary) those works away from the more valued designated site, habitat and species receptors where possible.	Project design process
ECoW	No – taken into account in the assessment of AEoI	A suitably qualified ECoW will be employed for the duration of the construction period (and any subsequent reinstatement works), although this may not necessarily be a full-time role throughout. The ECoW will oversee the implementation of a LEMP and check that the works comply with applicable wildlife legislation and the relevant commitments made in this ES and associated management plans. The ECoW will provide regular reports to Natural England and other relevant stakeholders throughout the construction period (and subsequent reinstatement). The frequency and format of these updates will be agreed as part of the detailed LEMP.	DCO
Seasonally restricted works	No – taken into account in the assessment of AEoI	Seasonal restrictions will be implemented to restrict works with potential to cause significant disturbance to the non-breeding waterbirds, including European golden plover and ruddy turnstone, in Pegwell Bay. These restrictions will apply to all works within inter-tidal habitats and at the shoreline, including all works on or within any cofferdam at the proposed landfall location. This will prevent any works taking place in these areas during the period October to March inclusive. Any driven/ percussive piling elsewhere within Pegwell Bay Country Park, e.g. if additional cofferdams are required to prevent the migration of contaminants if a buried solution is feasible (landfall options 1 and 3), would be subject to a timing restriction and would not take place during the period October to March. HDD works (landfall option 1), if feasible, would also be subject to the same timing restriction. Further details of proposed timing restrictions are provided in the Outline LEMP (Document Ref: 8.7).	DCO
Screening of works	No – taken into account in the assessment of AEoI	Any works within 250m of inter-tidal habitats, which are undertaken between October and March but are not covered by seasonal restrictions and are in direct line of sight from inter-tidal habitats, e.g. works on the TJBs, will only take place following the erection of screening fencing to avoid visual disturbance to non-breeding waterbirds, including European golden plover and ruddy turnstone, using intertidal habitats. The details of proposed screening will be provided in the detailed LEMP and will be subject to agreement with Natural England. Further details are provided in the Outline LEMP (Document Ref: 8.7).	DCO

Mitigation measures embedded into the project design	Relevant for Screening of LSE?	Aim of the mitigation	Mechanism for Securing Mitigation
Saltmarsh mitigation and reinstatement (in respect of intertidal habitat for non-breeding waterbirds)	No – taken into account in the assessment of AEoI	Details of measures to reinstate and restore saltmarsh habitat providing supporting habitat for non-breeding waterbirds, including European golden plover and ruddy turnstone, following construction, are provided in the draft Saltmarsh Mitigation and Reinstatement Plan (Document Ref: 8.13).	DCO
Mitigation for terrestrial invertebrates	No – taken into account in the assessment of AEoI	A terrestrial invertebrate mitigation strategy, informed by a detailed invertebrate survey of affected areas, will form part of the detailed LEMP to be developed and agreed post consent but prior to construction commencing. Specific measures will be developed to reduce effects on important species (including species forming part of the Thanet Coast and Sandwich Bay Ramsar wetland invertebrate assemblage, if present) and to ensure that suitable habitat for these species is maintained and enhanced following construction works. Further details are provided in the Outline LEMP (Document Ref: 8.7).	DCO
Mitigation for possible displacement of recreational visitors to Pegwell Bay Country Park	No – taken into account in the assessment of AEoI	<p>Mitigation to minimise disturbance to non-breeding waterbirds, including European golden plover and ruddy turnstone, from displaced visitors would include:</p> <ul style="list-style-type: none"> Erection of additional signs to discourage people from entering intertidal habitats during sensitive periods; and The ECoW (or temporary warden / natural ambassador) would monitor visitor disturbance to intertidal areas across all parts of Pegwell Bay during the sensitive October to March period and, if required, would speak to visitors to discourage them from entering intertidal habitats. Regular reports to Natural England and other relevant stakeholders regarding the outcome of the monitoring and visitor interactions will be provided throughout the construction period. The frequency and format of these updates will be agreed as part of the detailed LEMP. <p>Further details are provided in the Outline LEMP (Document Ref: 8.7). These details will be developed further as part of the detailed LEMP and will be subject to agreement with Natural England and other relevant stakeholders.</p>	DCO
Construction works (general)	No – forms part of the project design	A CoCP, which includes a section setting the principles for the CEMP, forms part of the application (Document Ref: 8.1). A detailed CEMP will be submitted post consent in accordance with the CoCP. The CoCP includes details of measures to minimise construction impacts within the onshore environment, including accidental pollution and the spread of invasive non-native species (INNS). It also includes a list of more detailed plans to be produced and agreed post consent.	DCO
Pollution Prevention	No – forms part of the project design	<p>A PEMP is standard for works below MHWS and will be produced post consent and followed to cover the construction and O&M phases of Thanet Extension. This will incorporate plans to cover accidental spills, potential contaminant release and include key emergency contact details (e.g. MMO, MCA and the project site coordinator). A Decommissioning Programme will be developed to cover the decommissioning phase.</p> <p>The CoCP (Document Ref: 8.1) provides details of measures to avoid accidental spills and potential release of contaminants within the onshore environment. Further details will be provided in the detailed CEMP to be submitted and agreed post consent.</p>	DCO

Mitigation measures embedded into the project design	Relevant for Screening of LSE?	Aim of the mitigation	Mechanism for Securing Mitigation
Mitigation for possible disturbance during O&M works	No – taken into account in the assessment of AEoI	<p>Planned O&M works at the shoreline or within intertidal habitats will avoid the period October to March inclusive (as for construction). Planned inspections will follow an agreed methodology, set out in the detailed LEMP, designed to avoid damage to sensitive habitats or disturbance to sensitive species. Further details are provided in the Outline LEMP (Document Ref: 8.7).</p> <p>Unplanned works are by their nature unpredictable, however such works will be undertaken in consultation with SNCBs at the time such works are required, to determine the need for mitigation in relation to the works required, including the nature and timing of those works.</p>	DCO
Decommissioning	No – taken into account in the assessment of AEoI	Embedded mitigation measures implemented in the Decommissioning Phase are likely to be similar to those implemented during the Construction Phase.	DCO

7 The Screening Process for the Project Alone

7.1 Screening Undertaken for Thanet Extension

- 7.1.1 As noted in section 1 above, the first stage to the HRA process is Screening, the process followed to identify the potential for LSE from the project, alone and in-combination, on European sites of nature conservation importance. Screening for Thanet Extension alone was undertaken during PEIR, with the Screening Report undergoing consultation prior to finalisation in September 2017 (see section 4).
- 7.1.2 The Screening Report, as finalised at that time, has been appended to the RIAA (Annex 1 (Document Ref: 5.2.1)) but not repeated in full. Instead, the approach taken has been to revisit the screening within section 7 of the RIAA and update conclusions on LSE where relevant, for example where subsequent consultation identified an additional designated site for consideration.
- 7.1.3 Shortly before finalisation of the RIAA, the Sweetman II ruling was issued (as referenced in Section 2). That ruling has implications for screening of LSE in that the process for identifying the potential for a LSE to arise should be conducted in advance of the application of any additional mitigation to reduce an impact on a receptor. This represents a change in current practice where all relevant mitigation has been considered as being applied in the LSE screening process (rather than in the assessment of potential adverse effect as is now considered to be the case).
- 7.1.4 In response, the initial conclusions on LSE (as presented in the screening report as Table 8.1), have been revisited and included as an appendix to the Screening Report (Annex 1; Document Ref 5.2.1). Two additional columns have been added to the original Table 8.1, the first to identify if the decision on LSE screening took account of mitigation, and the second to confirm or update the screening decision. Where LSE had been screened in for LSE at that time, that decision remains valid in the table. It is clear that for the original screening undertaken in 2017, mitigation had not been a factor in screening LSE out. For decisions where LSE had been screened out, with no relevant mitigation influencing the decision, the decision remains.
- 7.1.5 The updated Table 8.1 (as presented within Appendix 1 of the Screening Report (Annex 1; Document Ref: 5.2.1) is then considered further below, should information subsequent to the Screening Report result in a change in that screening decision (provided that change would remain compliant with Sweetman II).

7.2 Approach to Screening

- 7.2.1 A summary of the approach followed for screening and the findings for Thanet Extension alone are provided below. It should be noted that following completion of Screening, and taking account of any changes made to that screening post Sweetman II (see Annex 1 of Appendix 1 (Document Ref: 5.2.1)), a number of changes have occurred that have affected the conclusions on screening. The resulting changes in Screening, in terms of the designated sites and their relevant features screened in for LSE, are summarised within this section. Screening in-combination is presented in section 8.
- 7.2.2 The purpose of Screening is to identify the European and Ramsar sites (with their associated features) for consideration within the overall HRA process. Once screened in for consideration, the potential for LSE is determined. The screening process followed a series of defined criteria, to ensure a clear and transparent process. The criteria applied are summarised below in Table 7.1 (it should be noted that an additional quantitative assessment was also carried out in relation to offshore ornithology). All screened in sites and features are summarised in Table 7.1, including the conclusions on the potential for LSE.

Table 7.1: Screening criteria for the initial identification of SACs, SPAs and Ramsar sites

Criteria used for initial identification of European and Ramsar sites		Specific criteria
1	European or Ramsar site that overlaps with Thanet Extension boundary (array, cable corridor, substation AoS).	Physical overlap between project boundary and designated site.
2	SAC supports mobile populations of qualifying features (e.g. marine mammals, migratory fish, bats and otters) that may interact with potential effects associated with Thanet Extension. <i>SPA or Ramsar site has interest features that nest and raise their young within the site during the breeding season and then occur in the region of Thanet Extension outside the breeding season, either on migration (passage) or throughout the winter.</i>	Where a designated site hosts a mobile species whose range may include Thanet Extension– e.g. North Sea Management Unit for cetaceans. <i>Identified by the application of the information on migratory movements and winter distribution (e.g. Wernham et al., 2002; Balmer et al., 2013).</i>
3	SAC with qualifying species whose mean maximum foraging or migratory range overlaps with Thanet Extension. <i>SPA or Ramsar site is outside the offshore zone (i.e. above MLWS) but has interest features that, whilst nesting onshore, forage offshore during the breeding season.</i>	Where a qualifying species has a known foraging or migratory range that includes Thanet Extension (e.g. seals). <i>Identified by the application of the mean maximum foraging range from the standard reference: Thaxter et al. (2012).</i>
4	SAC and/ or a qualifying feature located within the potential range of effect associated with Thanet Extension. <i>SPA or Ramsar site overlaps with the potential extent of impacts associated with Thanet Extension.</i>	Where the potential effects associated with Thanet Extension extend beyond the boundary of the project and reach a designated site. <i>Identified by a physical overlap of the designated site and the potential extent of impact.</i>
5	SAC qualifying habitat or species recorded during site specific surveys. <i>SPA or Ramsar site has interest features that use that site in the non-breeding season and then occur in the region of Thanet Extension on migration (passage).</i>	Presence of a qualifying habitat or species at Thanet Extension that can be associated with a SAC. <i>Identified by the application of the information on migratory movements to and from the UK in the standard reference: Wright et al., 2012.</i>

7.3 Definition of the Study Area

- 7.3.1 The extent of the study area for each receptor group is a function of the screening process, and therefore takes account of the ecology of the habitat(s) and/ or species and the potential for effect (the latter including the predicted scale of effect).
- 7.3.2 The study area for **subtidal and intertidal benthic habitats** included designated sites that triggered one or more of the following:
- Designated sites with a physical overlap with the array or offshore cable corridor (including landfall); and
 - Designated sites within the maximum range of relevant effect (being up to 14 km from the project boundary).
- 7.3.3 The study area for the highly mobile **marine mammal** species is within that applied within the ES (Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7)), with the ES marine mammal study area being species specific but taking account of ecology and behaviour. For the RIAA, a species specific screening range has been applied within the wider ES study area, applied from the project extents and to identify relevant designated sites. For seals, the screening area was effectively defined by the foraging range of harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*), being 120 km and 145 km respectively (SMRU, 2011 for harbour seal and Thompson *et al.* 1996 for grey seal). For harbour porpoise (*Phocoena phocoena*), the range applied is 26 km (derived from the draft advice issued by JNCC, which identified that ‘Habitats Regulations Assessment (HRA) will be considered for all new developments (coastal and marine) using pile driving within the site or within 26 km’ (JNCC, 2016)).
- 7.3.4 The study area for **onshore biodiversity** included all European Sites within 2 km of the RLB, plus (onshore) European sites of ornithological importance (i.e. SPAs and some Ramsar sites) within a distance of up to 20 km.
- 7.3.5 For **offshore ornithology** receptors, the study area was focused on the proposed WTG array and a 4 km buffer placed around it and it was within this area that new survey work was carried out using the aerial digital stills survey technique (the method is described in the Baseline Technical Report – Volume 4, Annex 6-1). Account had to be taken of the fact that birds are mobile and those observed within the study area may be associated with SPA and Ramsar sites that can be some distance away. For instance non-breeding auk species observed in the winter months in the study area may have come from breeding colonies that could be hundreds of kilometres away.

7.4 Definition of Effects (Subtidal and Intertidal Benthic Habitats)

7.4.1 The Screening Report identified a number of potential effects with respect to subtidal and intertidal benthic habitats that may arise during the construction, O&M and decommissioning of Thanet Extension. The terminology applied followed that applied within the PEIR and now within the ES, however it is recognised that the terminology may differ from that applied within relevant Advice on Operations (e.g. the advice contained within the Regulation 35 advice provided for the Margate and Long Sands SAC⁷). For simplicity and consistency, a comparison of relevant terms is provided below in Table 7.2.

Table 7.2: Comparison of relevant terms used to define potential effect for subtidal and intertidal benthic ecology

Potential effect term applied here	Equivalent term(s) from Advice on Operations
Temporary habitat loss/ disturbance	<ul style="list-style-type: none"> • Abrasion/ disturbance of the substrate on the surface of the seabed • Habitat structure changes - removal of substratum (extraction) • Penetration and/ or disturbance of the substratum below the surface of the seabed, including abrasion
Increases in suspended sediments, with subsequent deposition	<ul style="list-style-type: none"> • Changes in suspended solids (water clarity) • Smothering and siltation rate changes (Light-heavy)
Accidental pollution	<ul style="list-style-type: none"> • Deoxygenation • Temperature decrease (Cables – in operation) • Temperature increase (Cables – in operation)
Changes to physical processes	<ul style="list-style-type: none"> • Water flow (tidal current) changes, including sediment transport considerations
Long-term physical loss of habitat	<ul style="list-style-type: none"> • Habitat structure changes - removal of substratum (extraction) • Penetration and/ or disturbance of the substratum below the surface of the seabed, including abrasion • Physical loss (to land or freshwater habitat)
Introduction of hard substrate	<ul style="list-style-type: none"> • Introduction or spread of Invasive Non-Native Species (INNS) • Physical change (to another sediment type)
EMF	<ul style="list-style-type: none"> • Electromagnetic changes

⁷ <http://publications.naturalengland.org.uk/file/3271272>

7.5 Confirmation of Screening

7.5.1 A summary of the changes made to the conclusions on LSE (as updated post Sweetman II and provided in Annex 1 of the Screening Report (Annex 1; Document Ref: 5.2.1)) subsequent to the issue of the revised Screening report (but independent of Sweetman II) is provided below, including reference to the reason for the change.

All Receptor Groups

7.5.2 During the preparation of the Screening Report, the potential for accidental pollution to occur throughout the project area during construction, O&M and decommissioning was recognised. Initially, the potential for accidental pollution was concluded to result in no LSE for all receptor groups, as a result of anticipated project mitigation typically applied to OWFs. However, in their response of 26th July 2017, Natural England found that:

'We acknowledge that a CoCP and EPMP will be agreed with the aim to avoid impacts through accidental pollution. However, given the early stage of the process, we are unable to agree that there will be no LSE until these documents have been agreed between relevant parties.'

7.5.3 Accidental pollution was therefore ruled in for LSE for all receptors associated with sites in close proximity to the works.

7.5.4 Similarly, the potential for the introduction of hard substrate following construction of Thanet Extension to result in the spread of Invasive Non-Native Species (INNS) were screened in by the Screening Report for potential LSE for a number of designated sites, with Natural England highlighting the risk primarily for onshore sites in their letter dated 26th July 2017.

7.5.5 Following the finalisation of the Screening Report in September 2017 until now (June 2018), considerable progress has been made with regards the relevant plans that address concerns around accidental pollution and the risk from INNS during construction. It should be noted that such pollution control measures are included as an integral part of the project design and form part of the wider project compliance requirements. As such, the measures are separate to and outside of the RIAA process, with the project as a whole requiring such measures in order to achieve consent. It is considered that these plans, prepared in consultation with Natural England (among others) and provided for within the DCO, provide sufficient certainty that the risk of accidental pollution at all stages of the project and the spread of INNS during construction is negligible and that measures will be in place to control and minimise such risk. The relevant plans are as follows (including where/ how these are or will be provided for):

- Code of Construction Practice (CoCP) (to be submitted at application) (Document Ref: 8.1);

- Construction Environmental Management Plan (CEMP) (principles for the CEMP set out in the CoCP, with a detailed CEMP to be submitted post consent and in accordance with the CoCP);
- Outline Landscape Ecological Management Plan (LEMP) (submitted at application) (Document Ref: 8.7);
- Construction Traffic Management Plan (TMP) (to be submitted post consent and in accordance with the CoCP);
- Air Quality Management Plan (AQMP) (to be submitted post consent); and
- Project Environment Management Plan (PEMP) (to be submitted post consent).

7.5.6 These set out measures that follow published guidelines and best working practice that include provision, among other requirements, for accidental pollution and the prevention of the release and spread of INNS. Further information on the relevant plans is provided within Table 6.1 on embedded mitigation.

7.5.7 With respect to the landfall, it is acknowledged that the historic landfill site represents a potential risk in terms of leachate. However, the option for construction at the landfall site is yet to be determined, being subject to results from site investigation works. The final option selected, together with the detailed design, will therefore be informed by the findings of those site investigation works. Each option includes embedded mitigation to manage the risk of accidental pollution by avoiding the introduction of a contamination pathway, as required by the wider consenting for the project. The CMS includes provision to ensure that the final option selected would not result in such a contamination pathway. It is therefore considered that the conclusions on LSE regarding accidental pollution are valid for all aspects of the project.

7.5.8 During O&M, there is a risk that hard substrate at Thanet Extension could be colonised by INNS. While colonisation by INNS of the hard substrate introduced at TOWF was not recorded in the post-construction surveys, the surveys were not able to fully determine whether colonisation had occurred and therefore it is possible that non-native species are present. However, it is noted that the construction of Thanet Extension would only enlarge the available habitat in this location rather than create a separate 'stepping stone' and as such the contribution of Thanet Extension to the increase in risk of non-native species is minimal.

7.5.9 As a result of the above, and remaining compliant with Sweetman II, the screening conclusions on Accidental Pollution during construction, O&M and decommissioning and the screening conclusion of the spread of INNS during construction and O&M throughout have been amended to no LSE, with these effects therefore not taken forward for consideration of the potential for an AEoI.

Subtidal and Intertidal Benthic Habitats

7.5.10 The Screening Report identified the anticipated effects from Thanet Extension on relevant offshore receptors in Table 7.3. These include the potential range of effect. At the time that the table (and assessment) were drafted, the physical processes chapter for PEIR was not available. Therefore, an assumption was made regarding the potential range of effect in relation to the potential for a temporary increase in suspended sediments, with subsequent deposition. The assumption made was as follows:

'It was concluded in the TOWF assessment that sand and coarse materials would only be dispersed over a short distance (typically meters) however silt and chalk would be carried in suspension across the full spring tidal excursion (approximately 10 km). Chalk sands, even at low concentrations, would cause the seawater to appear 'milky' when in suspension. A full physical processes assessment, including tidal excursions, will be undertaken for Thanet Extension and could be used to inform an AA. A dispersion of 10 km for very fine material is also supported by the observed turbid wakes at TOWF (ABPmer, 2017). This will be re-visited if required on receipt of the tidal excursion assessment being undertaken for Thanet Extension'

7.5.11 Following issue of the physical processes PEIR chapter, it became apparent that although the assumed 10 km range holds true for sediment disturbed during the installation of the cable, it does not hold true for sediment that may be disturbed during drilling of WTG foundations. For the latter, a range of up to 14 km is noted, subsequently amended to 13km in the ES physical processes chapter. The increase in range does not, however, change the conclusions on the potential for LSE as it does not screen in any additional sites.

7.5.12 Specifically in relation to the Thanet Coast SAC, the Screening Report considered the potential for effect on all features, however for clarity it should be noted that where potential for LSE was found (with the exception of accidental pollution and INNS, addressed above), this related to the chalk reef feature only and not submerged sea saves – the latter having been screened out of assessment and therefore not included here.

7.5.13 Further information on intertidal habitats is provided for below under onshore biodiversity (a function of the overlap between onshore ecological features and intertidal habitats).

Marine Mammals

7.5.14 During the transboundary consultation undertaken by PINS in July and August 2017, Natura 2000 sites were highlighted with respect to marine mammals by the Ministère de la transition écologique et solidaire in French waters⁸, specifically the Ridens et dunes hydrauliques, Bancs des Flandres and Récifs et Caps Gris Nez Blanc Nez). These were already considered within the Screening Report and therefore no change was required for these sites.

7.5.15 Further, during the Section 42 consultation, additional transboundary responses were received from the Ministère de la Transition Ecologique et Solidaire, referencing a number of sites for marine mammals. These included the Bancs des Flandres (grey seal and harbour porpoise), Ridens et dunes hydrauliques (grey seal, harbour seal and harbour porpoise) and Récifs Gris Nez Blanc Nez (grey seal, harbour seal and harbour porpoise). All these sites were considered during the screening process and therefore no change required. The Agence Française pour la Biodiversité similarly referred to these designated sites and species.

Onshore Biodiversity

7.5.16 The conclusions on potential LSE for onshore biodiversity within the Screening Report included the following (drawing on Table 8.1 of the Screening Report, as updated post Sweetman II and provided in Appendix 1 of the Screening Report (Annex 1; Document Ref: 5.2.1), but excluding accidental pollution and the spread of non-native species as discussed above under 'all receptor groups'):

- Habitat loss (permanent and/ or temporary) for Sandwich Bay SAC, Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar (construction, O&M);
- Temporary increase in SSC and deposition for Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar (ornithological features only) (construction, O&M);
- Noise disturbance for Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar (ornithological features only) (construction, O&M);
- Visual disturbance for Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar (ornithological features only) (construction, O&M); and

⁸<https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN010084/EN010084-000089->

<Reg%2024%20notification%20response%20from%20France%20Point%20Focal%20Convention%20de%20Espoo.pdf>

- Change to physical processes for Thanet Coast and Sandwich Bay SPA, Thanet Coast and Sandwich Bay Ramsar (ornithological features only) (O&M).

7.5.16 Changes to the conclusions drawn in the Screening Report are described and justified below, taking each potential effect in turn.

Habitat Loss

7.5.17 Since the production of the Screening Report (Annex 1, Document Ref: 5.2.1), scheme development has included the amendment of the onshore RLB to avoid the Sandwich Bay SAC onshore boundary and therefore remove any potential LSE associated with onshore qualifying habitats, i.e. fixed coastal dunes with herbaceous vegetation (grey dunes), embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), dunes with *Salix repens* spp. *argentea* (*Salicion arenaria*) and humid dune slacks. LSE relating to the permanent or temporary loss of qualifying habitats of Sandwich Bay SAC are therefore now screened out.

7.5.18 Breeding little tern is included as a qualifying feature for the Thanet Coast and Sandwich Bay SPA and Table 8.1 of the Screening Report highlighted the potential for LSE on this feature in respect of habitat loss (permanent and/ or temporary). However, little tern has not bred at Pegwell Bay for a number of years with Natural England (2014) stating that the species has not bred within the site for over ten years (see also ES Volume 5, Annex 5-4 Ornithology Baseline Report (Document Ref: 6.5.5.4)). Furthermore, the former breeding site was located to the east of the River Stour and will not be affected by the proposed development. LSE relating to habitat loss for little tern have therefore been screened out.

7.5.19 As regards the relevance of the intertidal habitats to the RIAA, within which a small area of saltmarsh (up to 1,399 m²) will be permanently lost under one of the three options at the landfall, the following points are pertinent:

- The conservation objectives for the Thanet Coast and Sandwich Bay SPA⁹ identify the need to maintain or restore specific attributes of the habitats of the qualifying features (including the extent, distribution, structure and function, supporting processes);
- The Regulation 33 document for the North East Kent EMS¹⁰ identifies the intertidal mudflats as being important for roosting and feeding in European golden plover, with the main feeding habitat being arable fields and grazing marsh located inland of the dunes;

- The Regulation 33 document for the North East Kent EMS identifies ruddy turnstone as feeding on sandy beaches and rocky shores, foraging on the tideline at high tide and roosting mainly on areas of sand and shingle but also manmade structures, fields at the top of cliffs and open space landward of the SPA boundary; and

- Saltmarsh is not included as a sub-feature of the Thanet Coast and Sandwich Bay SPA, whereas the intertidal mudflats are.

7.5.20 Since the production of the Screening Report, further analysis of non-breeding waterbird distribution in relation to the location of the proposed landfall has been undertaken (see ES Volume 5, Annex 5-13, Intertidal Waterfowl Data Analysis in Relation to Onshore Works (Document Ref: 6.5.5.13)). Non-breeding European golden plover and ruddy turnstone are included as qualifying features for the Thanet Coast and Sandwich Bay SPA and non-breeding ruddy turnstone is a qualifying feature for the Thanet Coast and Sandwich Bay Ramsar.

7.5.21 Under the maximum adverse scenario outline in section 5, the landfall could involve the permanent loss of up to 1,399 m² of saltmarsh habitat, extending to a maximum of 18.5 m from the existing seawall. The saltmarsh which could be lost represents upper saltmarsh, subject to tidal inundation on an infrequent basis and characterised by relatively tall (>30 cm), dense vegetation dominated by *Spartina*. It should also be noted that given the physical elevation of the upper saltmarsh (and therefore the potential for the tide to inundate the area), that the quality of the habitat is unlikely to change without physical intervention to the height of the land. Information on the potential importance of this upper saltmarsh habitat to the designated bird species has been drawn from the wider literature (e.g. Cramp & Perrins, 1997 *et seq.* and Gillings & Sutherland, 2007) but also Hodgson (2016) for ruddy turnstone and Henderson & Sutherland (2017) for European golden plover, as well as survey data collected in winter 2016-17 (ES Volume 5, Annex 5-4, Ornithology Baseline Report (Document Ref: 6.5.5.4)).

⁹ <http://publications.naturalengland.org.uk/file/4690519175200768>

¹⁰ <http://publications.naturalengland.org.uk/file/3229392>

- 7.5.22 European golden plover typically feed on intertidal mudflats and agricultural land (arable and pasture), roosting on intertidal mudflats at low tide, on open saltmarsh at low and high tide and on agricultural land (arable and pasture). Like most plovers, European golden plover avoids terrain in which it cannot easily run and which has poor visibility of approaching predators. The upper saltmarsh habitat to be lost does not provide suitable habitat for feeding or roosting European golden plover as the vegetation is too tall and dense. The area which could be lost is also situated adjacent to a well-used footpath and therefore subject to regular disturbance which further reduces its potential value to roosting European golden plover.
- 7.5.23 Survey data collected in winter 2016-17 (see ES Volume 5, Annex 5-4, Ornithology Baseline Report (Document Ref: 6.5.5.4)) identified the presence of a roosting flock of 300 European golden plover in close proximity to the location of the landfall on a single hourly count during the November 2016 survey visit, i.e. on one out of 30 counts. There were no other records of European golden plover in the immediate vicinity of the landfall during the remainder of the winter 2016-17 surveys. The survey data indicate a very small overlap between a small number of birds forming part of this flock and the area which could be affected by the extension of the seawall (see ES Volume 5, Annex 5-13, Intertidal Waterfowl Data Analysis in Relation to Onshore Works (Document Ref: 6.5.5.13), Figure 5). However, mapping the location of flocks of waterbirds in the field is subject to a relatively high degree of error and in reality it is considered likely that these birds were actually using the more open saltmarsh, just to the east of the area which could be affected by the seawall extension, where the habitat is more suitable for them. Even in the unlikely event that small numbers of birds were using the unsuitable upper saltmarsh habitat on this occasion, the very low number of birds affected and the infrequency of use indicates that the level of usage is not significant.
- 7.5.24 Outside the breeding season ruddy turnstone are almost entirely coastal preferring shores which are stony, rocky or covered with seaweed. The upper saltmarsh habitat which could be lost is not suitable for ruddy turnstone and no ruddy turnstones were recorded within at least 500 m of the landfall during surveys in winter 2016-17. Hodgson (2016) suggests that prior to high tide, ruddy turnstones from the Thanet Coast and Sandwich Bay SPA flew to join a roost, 2.5 km west of Whitstable Harbour on the north Kent coast, within the Swale SPA and some 18 km north-west of the proposed development. Tabulated survey results from the same report indicate that ruddy turnstone concentrations within the Thanet Coast and Sandwich Bay SPA occur mainly across the northern extremities of the SPA, heading west toward Whitstable, with Pegwell Bay supporting only a small proportion of the total SPA population.
- 7.5.25 Overall, it is concluded that there will therefore be no permanent loss of saltmarsh habitat suitable for non-breeding European golden plover and ruddy turnstone and therefore the permanent loss of saltmarsh habitat for these features, with respect to both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar, has been screened out. Disturbance within the muddy foreshore and open saltmarsh remains screened in, with the loss of saltmarsh assessed in full within the relevant sections of the ES.
- 7.5.26 RSPB requested further information in their Section 42 consultation response (see Table 4.1) regarding usage of inland non-intertidal habitat by European golden plover, noting that usage may vary between daytime and night time. Terrestrial habitats within and adjacent to the RLB include semi-improved grassland, which is mostly rank and interspersed with scrub, scrub and woodland/ scattered trees, amenity grassland and hard standing with early pioneer communities currently used for vehicle storage. None of these habitats are potentially suitable for European golden plover. There will therefore be no permanent or temporary loss of terrestrial habitat used by non-breeding European golden plover and therefore the loss of terrestrial habitat for European golden plover has been screened out.
- 7.5.27 Since the production of the screening report a more detailed assessment of the likelihood that species forming part of the wetland invertebrate assemblage qualifying feature of the Thanet Coast and Sandwich Bay Ramsar Site could be affected by the proposed development has been carried out (see ES Volume 4, Annex 5-6 Terrestrial Invertebrate Assessment Report (Document Ref: 6.5.5.6)). Three wetland invertebrate assemblage species: the wasp *Didineis lunicornis* (referred to by its old name *Alysson lunicornis* in the Ramsar Information Sheet (RIS)), the wasp *Ectemnius ruficornis* and the woodlouse *Eluma caelata* (referred to as *E. purpurescens* in the RIS) are considered to have the potential to be present within the RLB based on their known distribution and habitat requirements. All three species favour terrestrial habitats. Potential LSE in terms of terrestrial habitat loss for these species during construction have been screened in and are assessed under the onshore biodiversity heading in Section 11. During the operational phase, activities within Stonelees Nature Reserve (the only part of the Thanet Coast and Sandwich Bay Ramsar included within the onshore RLB) would be limited to a maximum of eight visits per year to joint pits. Although these visits are unlikely to result in disturbance/ loss to habitats used by these species, in the absence of mitigation LSE cannot be ruled out and potential effects are therefore assessed in Section 11.
- 7.5.28 All other wetland invertebrate assemblage species are not likely to be present within or adjacent to the RLB due to a lack of suitable habitat (see ES Volume 5, Annex 5-6: Terrestrial Invertebrate Assessment Report (Document Ref: 6.5.5.6) for further details). There is therefore no potential for LSE on these species and effects due to habitat loss for these species have therefore been screened out.

7.5.29 Temporary disturbance/ loss of intertidal habitat used by non-breeding European golden plover and ruddy turnstone (during construction and O&M) remains screened in and is addressed as part of the benthic intertidal assessment. The consideration of these effects is followed by an assessment of the implications for the qualifying bird features.

Temporary Increase in SSC

7.5.30 Effects on intertidal habitat used by non-breeding European golden plover and ruddy turnstone due to a temporary increase in SSC (during construction and O&M) remain screened in and are addressed as part of the benthic intertidal assessment. The consideration of these effects is followed by an assessment of the implications for the qualifying bird features. As noted above, little tern has not bred at Pegwell Bay for a number of years and effects on habitats used by little tern have been screened out.

Noise and Visual Disturbance

7.5.31 Since the production and agreement of the screening report, a number of embedded mitigation measures have been proposed to avoid potential noise and visual disturbance to European golden plover and ruddy turnstone using intertidal habitats (see Table 6-1). However, following the Sweetman II ruling, these measures cannot be taken into account during the initial screening for LSE. As such, assuming the absence of any mitigation measures, potential noise and visual disturbance effects remain screened in for LSE and are addressed in section 11.5.

7.5.32 As noted above, little tern has not bred at Pegwell Bay for a number of years and disturbance effects on little tern have therefore been screened out.

Changes to Physical Processes

7.5.33 Effects on intertidal habitat used by non-breeding European golden plover and ruddy turnstone due to changes to physical processes during O&M remain screened in and are addressed as part of the benthic intertidal assessment. The consideration of these effects is followed by an assessment of the implications for the qualifying bird features. As noted above, little tern has not bred at Pegwell Bay for a number of years and effects on habitats used by little tern due to changes to physical processes have therefore been screened out.

Displacement of Recreational Visitors to Pegwell Bay Country Park

7.5.34 Since the production of the screening report, Natural England raised concerns in October 2017 (see Table 4.1) regarding the possible effects of visitor displacement during construction from Pegwell Bay Country Park to more sensitive areas of the coast, which could in turn lead to potential LSE on non-breeding European golden plover and ruddy turnstone forming part of the Thanet Coast and Sandwich Bay SPA population. A precautionary approach has been adopted and this potential effect has therefore been screened in and is assessed under the onshore biodiversity heading in Section 11.

7.5.35 In summary, the remaining effects screened in for LSE in relation to onshore biodiversity therefore relate to:

- Temporary disturbance/ loss of intertidal habitats for Thanet Coast and Sandwich Bay SPA qualifying species (non-breeding European golden plover and ruddy turnstone) and the Thanet Coast and Sandwich Bay Ramsar qualifying species non-breeding ruddy turnstone (construction, O&M) (assessed within the intertidal and subtidal benthic ecology assessment);
- Possible habitat loss (permanent and/ or temporary) for three species forming part of the Thanet Coast and Sandwich Bay Ramsar wetland invertebrate assemblage (if present): the wasps *Didineis lunicornis* and *Ectemnius ruficornis* and the woodlouse *Eluma caelata* (construction, O&M) (assessed within the onshore biodiversity assessment);
- Temporary increase in SSC and deposition for the intertidal habitats of the qualifying features for Thanet Coast and Sandwich Bay SPA (non-breeding European golden plover and ruddy turnstone) and Thanet Coast and Sandwich Bay Ramsar (non-breeding ruddy turnstone) (construction, O&M) (assessed within the intertidal and subtidal benthic ecology assessment);
- Noise and visual disturbance to Thanet Coast and Sandwich Bay SPA qualifying species (non-breeding European golden plover and ruddy turnstone) and the Thanet Coast and Sandwich Bay Ramsar qualifying species non-breeding ruddy turnstone (construction, O&M) (assessed within the onshore biodiversity assessment);
- Change to physical processes for the habitats of the qualifying features for Thanet Coast and Sandwich Bay SPA (non-breeding European golden plover and ruddy turnstone) and Thanet Coast and Sandwich Bay Ramsar (non-breeding ruddy turnstone) (O&M) (assessed within the intertidal and subtidal benthic ecology assessment); and
- Possible displacement of recreational users from Pegwell Bay Country Park causing disturbance to the qualifying features for Thanet Coast and Sandwich Bay SPA (non-breeding European golden plover and ruddy turnstone) and Thanet Coast and Sandwich Bay Ramsar (non-breeding ruddy turnstone) (construction only) (assessed within the onshore biodiversity assessment).

Offshore Ornithology*Transboundary consultation*

7.5.36 During the transboundary consultation undertaken by PINS in July and August 2017, the French Ministère de la transition écologique et solidaire identified two sites classified under the Birds Directive for their ornithology interest features. These sites are Cap Gris Nez SPA and Bancs des Flandres SPA. The sites have both offshore and terrestrial interest features. The Cap Gris Nez SPA has 75 bird species listed as interest features including non-breeding seabirds, seaducks, divers, grebes, geese, waders and terns. The Bancs des Flandres SPA has 25 bird species listed as interest features including breeding little tern and non-breeding seabirds, seaducks, divers, grebes, geese and terns. As noted in Table 7.3 of Annex 1 (Document Ref: 5.2.1), all onshore features are screened out from assessment due to the distance between Thanet Extension and the designated sites.

7.5.37 For offshore ornithology, these two French sites were screened for LSE on their offshore ornithology interest features in the same manner as the SPA and Ramsar sites occurring in UK waters (Tables 7.1 and 7.3 of Annex 1 (Document Ref: 5.2.1)).

7.5.38 For the Cap Gris Nez SPA, the conclusions made with regard to the five offshore ornithology relevant screening criteria were:

- Physical overlap of SPA/ pSPA/ Ramsar with the project boundary – there is no overlap; not screened in on that basis;
- Breeding interest feature of SPA/ pSPA/ Ramsar whose migratory movements and/ or winter distribution coincides with Thanet Extension – the site is classified for its non-breeding interest; not screened in as no breeding interest features;
- Breeding interest feature of SPA/ pSPA/ Ramsar that forages offshore during the breeding season – the site is classified for its non-breeding interest; not screened in as no breeding interest features;
- Physical overlap of SPA/ pSPA/ Ramsar with the potential extent of impacts associated with Thanet Extension – there is no overlap as the extent of potential impacts from Thanet Extension is not as far as this SPA that is 43 km from the array and 32 km from the offshore cable corridor; not screened in on that basis; and
- Non-breeding interest features of SPA/ pSPA/ Ramsar occurs in the region of Thanet Extension on migration – the migratory pathways of the non-breeding seabirds, seaducks, divers, grebes, and terns take them along the French and Belgian coasts (flying through rather than across the Channel) and not across the proposed Thanet Extension; not screened in on that basis.

Conclusion: The Cap Gris Nez SPA is not screened in.

7.5.39 For the Bancs des Flandres SPA, the conclusions made with regard to the five offshore ornithology relevant screening criteria were:

- Physical overlap of SPA/ pSPA/ Ramsar with the project boundary – there is no overlap; not screened in on that basis;
- Breeding interest feature of SPA/ pSPA/ Ramsar whose migratory movements and/ or winter distribution coincides with Thanet Extension – the breeding interest feature is little tern whose migration to more southerly waters in the non-breeding season will not be across the proposed Thanet Extension; not screened in on that basis
- Breeding interest feature of SPA/ pSPA/ Ramsar that forages offshore during the breeding season – the breeding interest feature is little tern whose mean maximum foraging range is 6.3 km, the French coast within the Bancs des Flandres SPA is 42 km distant from the array and accordingly it will not forage across the proposed Thanet Extension array and be placed at risk of collision; not screened in on that basis;
- Physical overlap of SPA/ pSPA/ Ramsar with the potential extent of impacts associated with Thanet Extension – there is no overlap as the extent of potential impacts from Thanet Extension is not as far as this SPA that is 23 km from the array and 27 km from the offshore cable corridor; not screened in on that basis; and
- Non-breeding interest features of SPA/ pSPA/ Ramsar occurs in the region of Thanet Extension on migration – the migratory pathways of the non-breeding seabirds, seaducks, divers, grebes, and terns take them along the French and Belgian coasts (flying through rather than across the Channel) and not across the proposed Thanet Extension; not screened in on that basis.

Conclusion: The Bancs des Flandres SPA is not screened in.

Consultation on the draft RIAA

7.5.40 The responses received to the consultation undertaken on the draft RIAA (Table 4.1) included a small number of comments that specifically related to the screening of interest features of particular sites.

7.5.41 Natural England suggested that consideration was given to screening in little gull in relation to collision risk, little gull being an interest feature of the Greater Wash SPA [noting that in the response it was described as a pSPA but the site was classified on March 28th 2018]. Little gull was only recorded on a single occasion, during the boat based survey carried out in January 2016. A single bird was recorded in flight within the area of the 4 km buffer placed around the proposed Thanet Extension. The approach to screening in those instances where only very small numbers were recorded in recent site based surveys is described in section 7 of the original Screening Report in Annex 1 (Document Ref: 5.2.1). Little gull fulfils the criteria for screening out, it was previously screened out, no new information has been obtained and there is no change to that decision. Conclusion: Little gull, a non-breeding interest feature of the Greater Wash SPA is not screened in.

Recent changes to the classification of protected sites

7.5.42 The UK Government has a continuing programme to increase the extent to which Annex 1 and migratory birds when using marine waters are protected by the classification of SPAs. This includes through extending the species coverage of SPAs by adding further birds as interest features to existing SPAs, by extending the spatial coverage of SPAs by adding to their area and by classifying new SPAs such that seabirds which breed at onshore colonies are also protected when using offshore waters. Progress with this programme has meant that a number of sites that were not included in the HRA Screening Report now need to be considered as to whether the relevant sites and particular interest features should be screened in on account of the potential for LSE. That additional consideration of sites is carried out below with a conclusion made for each site and particular interest features.

7.5.43 At the time of the preparation of the HRA screening Report an extension had been proposed to the Outer Thames Estuary SPA to add common tern and little tern as interest features and increased the area of the SPA by including nearshore waters in Essex, Suffolk and Norfolk that are used by these two species when foraging away from the onshore breeding colonies. This extension to the Outer Thames Estuary SPA was screened for LSE on its offshore ornithology interest features in the same manner as were other SPA sites in the HRA Screening Report (Tables 7.1 and 7.3). In late 2017 an extended Outer Thames Estuary was classified by incorporating the proposals referred to above. For completeness of referencing to the screening process this paragraph refers to the proposed extension but all subsequent sections assess only the single, extended SPA and its interest features. The conclusions made with regard to the five relevant offshore ornithology screening criteria and in relation to particular interest features and phases of the proposed development were:

- Physical overlap of SPA/ pSPA/ Ramsar with the project boundary – there is no overlap, not screened in on that basis (applies to all interest features and phases of the proposed development);

- Breeding interest feature of SPA/ pSPA/ Ramsar whose migratory movements and/ or winter distribution coincides with Thanet Extension – the migration movements of common tern and little tern to or from more southerly waters in the non-breeding season will potentially be across the proposed Thanet Extension. Such passage birds are not considered sensitive to displacement or disturbance effects at any phase of the proposed development. Such passage birds from this nearby site might be placed at risk of collision during the operational phase of the proposed development. Common tern and little tern are screened out from potential LSE resulting from displacement or disturbance effects at any phase of the proposed development. Common tern and little tern are screened in for collision risk during the operational phase;
- Breeding interest feature of SPA/ pSPA/ Ramsar that forages offshore during the breeding season – the breeding interest features common tern and little tern have mean maximum foraging ranges of 15.2 km and 6.3 km respectively, the nearest breeding colony within onshore SPAs for which the proposed extension to include offshore waters are identified for common tern is at New England Creek within the Foulness SPA that is 46 km distant from the array and for little tern is at Shell Ness Point within the Thanet Coast and Sandwich Bay SPA (notwithstanding that the species does not currently breed there) that is 23 km distant from the array. Neither species is considered sensitive to displacement or disturbance effects at any phase of the proposed development. Neither species will forage across the proposed Thanet Extension array and be placed at risk of collision during the operational phase. Common tern and little tern are screened out from potential LSE resulting from displacement or disturbance effects and collision risk;
- Physical overlap of SPA/ pSPA/ Ramsar with the potential extent of impacts associated with Thanet Extension – there is no overlap as the extent of potential impacts from Thanet Extension is not as far as those locations within the proposed SPA where the two tern species will forage; not screened in on that basis (applies to all interest features and phases of the proposed development); and
- Non-breeding interest features of SPA/ pSPA/ Ramsar occurs in the region of Thanet Extension on migration – the proposed extension is to include common tern and little tern as breeding species interest features; not screened in as no non-breeding interest features added by the extension (applies to all interest features and phases of the proposed development).

Conclusion: The common tern and little tern interest features of the proposed extension to the Outer Thames Estuary SPA (now interest features of the classified SPA) are screened in for collision risk in the O&M phase.

7.5.44 Progress has been made with the classification of waters off the east coast of England and as a result of that the now classified Greater Wash SPA has been considered for screening. Its interest features are red-throated diver (non-breeding), common scoter (non-breeding), little gull (non-breeding), Sandwich tern (breeding), common tern (breeding) and little tern (breeding).

7.5.45 For the Greater Wash SPA, the conclusions made with regard to the five relevant offshore ornithology screening criteria and in relation to particular interest features and phases of the proposed development were:

- Physical overlap of SPA/ pSPA/ Ramsar with the project boundary – no overlap exists and on that basis is not screened in (applies to all interest features and all phases of the proposed development);
- Breeding interest feature of SPA/ pSPA/ Ramsar whose migratory movements and/ or winter distribution coincides with Thanet Extension – the migration movements of the three breeding tern species to or from more southerly waters in the non-breeding season will potentially be across the proposed Thanet Extension. Such passage birds are not considered sensitive to displacement or disturbance effects at any phase of the proposed development. Such passage birds from this more distant site than the Outer Thames Estuary SPA will mix with other breeding populations in the course of their migratory movement. The proportion of terns from the Greater Wash SPA within the numbers passing through the site of the proposed development will be low. The number of Sandwich, common and little tern recorded within and around the site of the proposed Thanet Extension was low or zero over the 24 month period of aerial surveys (the boat based surveys took place in the winter when terns are not present). Sandwich tern was only recorded in flight on three occasions, common (as common/Arctic species group) was only recorded in flight on two occasions and little tern was not recorded at all. As a result the number of Sandwich, common or little tern that might be placed at risk of collision during the operational phase of the proposed development is very low and insignificant. Sandwich, common and little tern are screened out from potential LSE resulting from displacement or disturbance effects at any phase of the proposed development and screened out for collision risk during the operational phase.
- Breeding interest feature of SPA/ pSPA/ Ramsar that forages offshore during the breeding season – the three breeding tern species have mean maximum foraging ranges from the identified breeding colonies that are shorter than the 126 km from the SPA boundary to the to the proposed Thanet Extension (the relevant tern breeding colonies are even further); not screened in on that basis (applies to all relevant breeding interest features and all phases of the proposed development);

- Physical overlap of SPA/ pSPA/ Ramsar with the potential extent of impacts associated with Thanet Extension – there is no overlap as the extent of potential impacts from Thanet Extension is not as far as this SPA which is 126 km distant; not screened in on that basis (applies to all interest features and all phases of the proposed development); and
- Non-breeding interest features of SPA/ pSPA/ Ramsar occurs in the region of Thanet Extension on migration - the migration movements of the non-breeding interest features red-throated diver, common scoter and little gull to or from more northerly breeding sites will not take them across the proposed Thanet Extension. As a result these non-breeding interest features are screened out from potential LSE (applies to all relevant interest features and all phases of the proposed development).

7.5.46 Conclusion: None of the interest features of the recently classified Greater Wash SPA are screened in for any of the potential effects identified in any phase of the development.

7.5.47 Progress has been made with the classification of waters off the north-east coast of England and as a result of that the now classified Northumberland Marine SPA has been considered for screening. Consequent upon that is that the associated onshore seabird colony SPAs also come in to scope for screening and that SPA which supports breeding guillemot (a species which regularly occurs in Thanet Extension offshore area in the non-breeding season) – the Farne Islands SPA - has also been considered for screening. Both these SPAs were screened for LSE on their offshore ornithology interest features in the same manner as were other SPA sites in Annex 1 (Tables 7.1 and 7.3).

7.5.48 For the Northumberland Marine SPA, the conclusions made with regard to the five relevant offshore ornithology screening criteria and in relation to particular interest features and phases of the proposed development were:

- Physical overlap of SPA/ pSPA/ Ramsar with the project boundary – there is no overlap, not screened in on that basis (applies to all interest features and phases of the proposed development);

- Breeding interest feature of SPA/ pSPA/ Ramsar whose migratory movements and/ or winter distribution coincides with Thanet Extension - the migration movements of the five species of tern (Arctic, common, little, roseate and Sandwich) that are breeding interest features will take them through the Channel but none or very few were recorded in the surveys (see Volume 4, Annex 4-1: Ornithology Baseline Report (Document Ref: 6.4.4.1)) and those individuals from this site will be mixed with birds from other SPAs and non-designated sites. Such passage birds are not considered sensitive to displacement or disturbance effects at any phase of the proposed development. Individuals from this site will make up a low proportion of the few terns observed that might be placed at risk of collision during the operational phase of the proposed development. Puffin, which is a breeding interest feature, was not recorded in the baseline surveys or in the post-consent surveys for TOWF (Percival, 2015). Guillemot, which is a breeding interest feature, was recorded in the baseline surveys and hence its winter distribution does include the proposed Thanet Extension. Arctic, common, little, roseate and Sandwich tern are screened out from potential LSE resulting from displacement or disturbance effects and collision risk in all phases of the proposed development. Puffin is screened out as it does not occur. Guillemot is screened out from collision risk during the operational phase. Guillemot is screened in for displacement or disturbance effects in all phases of the proposed development;
- Breeding interest feature of SPA/ pSPA/ Ramsar that forages offshore during the breeding season – the breeding interest features have mean maximum foraging ranges that are considerably shorter than the 458 km to the proposed Thanet Extension; not screened in on that basis (applies to all interest features and phases of the proposed development);
- Physical overlap of SPA/ pSPA/ Ramsar with the potential extent of impacts associated with Thanet Extension – there is no overlap as the extent of potential impacts from Thanet Extension is not as far as this SPA which is 458 km distant; not screened in on that basis (applies to all interest features and phases of the proposed development); and
- Non-breeding interest features of SPA/ pSPA/ Ramsar occurs in the region of Thanet Extension on migration - the interest features are all breeding species; not screened in as no non-breeding interest features (applies to all interest features and phases of the proposed development).

Conclusion: The Arctic, common, little, roseate and Sandwich tern and puffin interest features of the Northumberland Marine SPA are screened out at all phases of the proposed development. The guillemot interest features of the Northumberland Marine SPA are screened in for displacement or disturbance effects at all phases of the proposed development but screened out for collision risk.

- 7.5.49 For the Farne Islands SPA, the conclusions made with regard to the five relevant offshore ornithology screening criteria and in relation to particular interest features and phases of the proposed development were:
- Physical overlap of SPA/ pSPA/ Ramsar with the project boundary – there is no overlap, not screened in on that basis (applies to all interest features and phases of the proposed development);
 - Breeding interest feature of SPA/ pSPA/ Ramsar whose migratory movements and/ or winter distribution coincides with Thanet Extension - the migration movements of the three species of tern (Arctic, common and Sandwich) that are breeding interest features will take them through the Channel but none or very few were recorded in the surveys (Document Ref: 6.4.4.1) and those individuals from this site will be mixed with birds from other SPAs and non-designated sites. Such passage birds are not considered sensitive to displacement or disturbance effects at any phase of the proposed development. Individuals from this site will make up a low proportion of the few terns observed that might be placed at risk of collision during the operational phase of the proposed development. Guillemot, which is a breeding interest feature, was recorded in the baseline surveys and hence its winter distribution does include the proposed Thanet Extension. Arctic, common and Sandwich tern are screened out from potential LSE resulting from displacement or disturbance effects and collision risk in all phases of the proposed development. Guillemot is screened out from collision risk during the operational phase. Guillemot is screened in for displacement or disturbance effects in all phases of the proposed development;
 - Breeding interest feature of SPA/ pSPA/ Ramsar that forages offshore during the breeding season – the breeding interest features have mean maximum foraging ranges that are considerably shorter than the 512 km to the proposed Thanet Extension; not screened in on that basis (applies to all interest features and phases of the proposed development);
 - Physical overlap of SPA/ pSPA/ Ramsar with the potential extent of impacts associated with Thanet Extension – there is no overlap as the extent of potential impacts from Thanet Extension is not as far as this SPA which is 512 km distant; not screened in on that basis (applies to all interest features and phases of the proposed development); and

- Non-breeding interest features of SPA/ pSPA/ Ramsar occurs in the region of Thanet Extension on migration - the interest features are all breeding species; not screened in as no non-breeding interest features (applies to all interest features and phases of the proposed development).

Conclusion: The Arctic, common and Sandwich tern interest features of the Farne Islands SPA are screened out at all phases of the proposed development. The guillemot interest features of the Farne Islands SPA is screened in for displacement or disturbance effects at all phases of the proposed development but screened out for collision risk.

Updated Screening for the Project Alone

7.5.50 Table 7.3 is adapted from Appendix 1 of Annex 1 (Document Ref: 5.2.1), which provides an update to the original Table 8.1 from the Screening report reflecting the changes considered relevant following the Sweetman II ruling. Table 7.3 therefore incorporates the changes in LSE screening described above and is also considered to be compliant with the Sweetman II ruling. The table summarises, on a site by site basis, the features screened in for LSE from the project alone. Where the Screening Report, or the changes described above, conclude no LSE, these are not included here. As such, the information presented summarises the sites, including the relevant habitats and species, screened in for LSE alone, including the relevant effects, and therefore confirms those sites (and the relevant features) for consideration of adverse effect. The full list of designated sites and potential effects considered are given in the revised HRA Screening report (Annex 1, Document Ref: 5.2.1, as updated post Sweetman II and provided in Appendix 1 of that document), together with the additions made above.

Table 7.3: Summary of Potential for LSE

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
Thanet Coast SAC	Chalk Reefs	<p>Potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements) and seabed preparation.</p> <p>Potential physical overlap with Annex I habitat (chalk reefs).</p> <p>Where possible, cable route will be micro-routed to avoid features present.</p>	<p>Physical loss of habitat offshore, resulting from the footprint/ presence of structures (i.e. cable protection) will reduce the area of available habitat.</p> <p>Potential for overlap between designated Annex I habitats offshore (chalk reefs) and cable corridor.</p> <p>The impacts from temporary habitat disturbance are likely to be similar to those for construction but the magnitude will be less. The frequency and duration of these impacts will be determined by the O&M requirements of the site.</p> <p>Potential physical overlap with designated Annex I habitats (chalk reefs).</p>	Similar to and potentially less than those outlined in the construction phase.
		<p>Increased SSCs may arise due to cable laying operations (including anchor placements), foundation installations and seabed preparation. Sediment deposition will occur as sediments settle out of the water column.</p> <p>Potential overlap between Annex I habitats (chalk reefs) and the defined Screening distance of increased suspended sediments.</p>	<p>Minor amounts of sediment may be released into suspension, with subsequent deposition, during the O&M phase. Although such quantities are typically likely to be small, localised and intermittent, should cable repairs be required, there is potential for further sediment to be released, with designated Annex I habitats (chalk reef) potentially being within the range of effect.</p> <p>The presence of manmade structures such as scour protection and foundations may result in localised changes in hydrodynamics and wave regimes. Therefore, as a secondary affect the sediment transport pathways may be altered.</p> <p>Potential for overlap between designated Annex I habitats (chalk reefs) and relevant range of effect. Any potential change in physical processes is likely to be localised and small scale.</p> <p>There is potential for EMF to affect benthic habitats.</p> <p>Potential for overlap with subtidal features only (designated Annex 1 chalk reefs).</p>	
Margate and Long Sands SAC	Sand banks which are slightly covered by sea water all the time	Increased SSCs may arise due to cable laying operations (including anchor placements), foundation installations and seabed	Minor amounts of sediment may be released into suspension, with subsequent deposition, during the O&M phase. Although such quantities are typically like to be small, localised and intermittent, should cable repairs be required, there is	Similar to and potentially less than those outlined in the

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
		<p>preparation. Sediment deposition will occur as sediments settle out of the water column.</p> <p>Potential for the defined Screening distance of increased suspended sediments to overlap with Annex I habitats.</p>	<p>potential for further sediment to be released, with Annex I habitats potentially being within the range of effect.</p> <p>The presence of manmade structures such as scour protection and foundations may result in localised changes in hydrodynamics and wave regimes. Therefore, as a secondary affect the sediment transport pathways may be altered.</p> <p>Potential for overlap between Annex I habitats and relevant range of effect. Any potential change in physical processes is likely to be localised and small scale.</p>	<p>construction phase.</p>
Thanet Coast & Sandwich Bay SPA	Ruddy turnstone (Non-breeding) European golden plover (Non-breeding)	<p>Potential temporary disturbance/ loss of intertidal habitat used by the qualifying species.</p>	<p>Potential temporary loss of intertidal habitat used by the qualifying species.</p>	<p>Similar to and potentially less than those outlined in the construction phase.</p>
		<p>Increased SSCs may arise due to cable laying operations in the intertidal and subtidal (including anchor placements), foundation installations and seabed preparation. Sediment deposition will occur as sediments settle out of the water column.</p> <p>Potential for the defined screening distance of increased suspended sediments to overlap with intertidal habitats used by the qualifying species.</p>	<p>Minor amounts of sediment may be released into suspension, with subsequent deposition, during the O&M phase. Although such quantities are typically like to be small, localised and intermittent, should cable repairs be required, there is potential for further sediment to be released, with intertidal habitats used by qualifying species potentially being within the range of effect.</p>	
		<p>Potential for noise and visual disturbance (in the absence of mitigation measures) during construction works in intertidal habitats and at the landfall. Noise disturbance also possible due to driven/ percussive piling within Pegwell Bay Country Park (if required). Visual disturbance also possible for works within 250 m of intertidal habitats and in direct line of sight.</p>	<p>Potential for noise and visual disturbance (in the absence of mitigation measures) during planned maintenance work at the landfall and within intertidal habitats.</p>	
		<p>Possible displacement of recreational visitors to Pegwell Bay Country Park leading to disturbance of the qualifying species elsewhere within the SPA.</p>	<p>The presence of manmade structures such as the intertidal works, scour protection and foundations may result in localised changes in hydrodynamics and wave regimes. Therefore, as a secondary affect the sediment transport pathways may be altered and intertidal habitats used by the qualifying species could be affected.</p>	

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
Thanet Coast & Sandwich Bay Ramsar	Ruddy turnstone (non-breeding) Wetland invertebrate assemblage	<p>Potential temporary disturbance/ loss of intertidal habitat used by the qualifying species (ruddy turnstone).</p> <p>Possible loss of habitat (permanent and/or temporary) for three species forming part of the wetland invertebrate assemblage: the wasps <i>Didineis lunicornis</i> and <i>Ectemnius ruficornis</i> and the woodlouse <i>Eluma caelata</i> (if present) during works within Stonelees Nature Reserve.</p>	<p>Potential temporary loss of intertidal habitat used by the qualifying bird species (ruddy turnstone).</p> <p>Possible disturbance or temporary loss of habitat to the same three wetland invertebrate assemblage species (if present) during planned maintenance works within Stonelees Nature Reserve.</p>	Similar to and potentially less than those outlined in the construction phase.
		<p>Increased SSCs may arise due to cable laying operations in the intertidal and subtidal (including anchor placements), foundation installations and seabed preparation. Sediment deposition will occur as sediments settle out of the water column.</p> <p>Potential for the defined screening distance of increased suspended sediments to overlap with intertidal habitats used by the qualifying bird species (ruddy turnstone).</p>	<p>Minor amounts of sediment may be released into suspension, with subsequent deposition, during the O&M phase. Although such quantities are typically like to be small, localised and intermittent, should cable repairs be required, there is potential for further sediment to be released, with the intertidal habitats used by qualifying bird species (ruddy turnstone), potentially being within the range of effect.</p>	
		<p>Potential for noise and visual disturbance (in the absence of mitigation measures) during construction works in intertidal habitats and at the landfall. Noise disturbance also possible due to driven/ percussive piling within Pegwell Bay Country Park (if required). Visual disturbance also possible for works within 250 m of intertidal habitats and in direct line of sight.</p>	<p>Potential for noise and visual disturbance (in the absence of mitigation measures) during planned maintenance work at the landfall and within intertidal habitats.</p>	
		<p>Possible displacement of recreational visitors from Pegwell Bay Country Park leading to disturbance of the qualifying bird species (ruddy turnstone) elsewhere within the Ramsar.</p>	<p>The presence of manmade structures such as the intertidal works, scour protection and foundations may result in localised changes in hydrodynamics and wave regimes. Therefore, as a secondary affect the sediment transport pathways may be altered, and intertidal habitats used by the qualifying bird species (ruddy turnstone) could be affected.</p>	
Southern North Sea cSAC	Harbour porpoise (<i>Phocoena phocoena</i>)	<p>Construction activities, in particular the pile-driving of foundations but also clearance of UXOs (if required), will result in high levels of underwater noise. Increased vessel traffic during construction may also result in increased noise levels.</p> <p>Thanet Extension is located within 0 km of the cSAC. There is potential for a significant effect.</p>	N/A	Similar to and potentially less than those outlined in the construction phase.

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
Single transboundary site for harbour porpoise: Bancs de Flandres SCI ¹¹	Harbour porpoise (<i>Phocoena phocoena</i>) (see below for seals)	Construction activities, in particular the pile-driving of foundations, will result in high levels of underwater noise. Increased vessel traffic during construction may also result in increased noise levels. The range applied to UK harbour porpoise sites for Screening of effect is 26 km. Bancs de Flandres SCI falls within 23 km, with potential for a LSE.	N/A	Similar to and potentially less than those outlined in the construction phase.
Eight transboundary sites for harbour seal: Bancs de Flandres Baie de Canche et couloir des trois estuaires Vlakte van de Raan Voordelta Estuaires et littoral picards (baies de Somme et d'Authie) Recifs Gris-Nez Blanc-Nez Vlaamse Banken Ridens et dunes hydrauliques du détroit du Pas-de-Calais	Harbour seal (<i>Phoca vitulina</i>) (see above for harbour porpoise and below for grey seal)	Construction activities, in particular the pile-driving of foundations, will result in high levels of underwater noise. Increased vessel traffic during construction may also result in increased noise levels. All the designated sites fall in the foraging range of harbour seal, with potential for a LSE.	N/A	Similar to and potentially less than those outlined in the construction phase.
Eleven transboundary sites for grey seal: Bancs de Flandres	Grey seal (<i>Halichoerus grypus</i>)	Construction activities, in particular the pile-driving of foundations, will result in high levels of underwater noise. Increased vessel traffic during construction may also result in increased noise levels.	N/A	Similar to and potentially less than those outlined in the

¹¹ Noting that the screening process, through the application of the 26km screening distance for harbour porpoise (as agreed with Natural England at the HRA Evidence Plan meeting of 2nd February 2017) screened out other transboundary sites for harbour porpoise, although the larger screening ranges for harbour seal and grey seal mean that a greater number of transboundary sites have been screened in for those species.

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
Baie de Canche et couloir des trois estuaires Vlakte van de Raan Voordelta Estuaires et littoral picards (baies de Somme et d'Authie) Recifs Gris-Nez Blanc-Nez Vlaamse Banken SBZ 1 SBZ 2 SBZ 3 Ridens et dunes hydrauliques du détroit du Pas-de-Calais	(see above for harbour porpoise and harbour seal)	All the designated sites fall in the foraging range of grey seal, with potential for a significant effect.		
Outer Thames Estuary SPA	Red-throated diver	Potential for disturbance and displacement of species will be species dependant, but up to 4 – 6 km for the most sensitive species Displacement extent of red-throated diver could extend to distance between Thanet Extension and SPA	Potential for disturbance and species will be species dependant, but up to 4 - 6 km for the most sensitive species Displacement extent of red-throated diver could extend to distance between Thanet Extension and SPA	Similar to and potentially less than those outlined in the construction phase.
	Common tern Little tern	N/A	Potential for the scale of collision mortality to result in a population decline for the tern species	N/A
Flamborough and Filey Coast pSPA	Gannet Kittiwake Guillemot Razorbill	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array (drawing on experience from post-construction studies at operating OWFs)	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array Potential for disturbance and displacement for guillemot and razorbill, not for gannet and kittiwake, could extend to a distance of 2 – 4 km beyond the array	Similar to and potentially less than those outlined in the construction phase.

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
		Potential for disturbance and displacement for guillemot and razorbill, not for gannet and kittiwake, could extend to a distance of 2 – 4 km beyond the array	Potential for the scale of collision mortality to result in a population decline for gannet and kittiwake but not guillemot and razorbill Screened in the HRA Screening Report drawing on the experience of CRM carried out for other consented OWFs	
Flamborough Head and Bempton Cliffs SPA	Kittiwake	N/A	Potential for the scale of collision mortality to result in a population decline for kittiwake Screened in the HRA Screening Report drawing on the experience of CRM carried out for other consented OWFs	N/A
Northumberland Marine SPA	Guillemot	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array (drawing on experience from post-construction studies at operating OWFs) Potential for disturbance and displacement for guillemot could extend to a distance of 2 – 4 km beyond the array	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array (drawing on experience from post-construction studies at operating OWFs) Potential for disturbance and displacement for guillemot could extend to a distance of 2 – 4 km beyond the array	Similar to and potentially less than those outlined in the construction phase.
Farne Islands SPA	Guillemot	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array (drawing on experience from post-construction studies at operating OWFs) Potential for disturbance and displacement for guillemot could extend to a distance of 2 – 4 km beyond the array	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array (drawing on experience from post-construction studies at operating OWFs) Potential for disturbance and displacement for guillemot could extend to a distance of 2 – 4 km beyond the array	Similar to and potentially less than those outlined in the construction phase.
St Abb’s Head to Fast Castle SPA	Kittiwake Guillemot Razorbill	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array (drawing on experience from post-construction studies at operating OWFs) Potential for disturbance and displacement for guillemot and razorbill, not for the herring gull and kittiwake, could extend to a distance of 2 – 4 km beyond the array	Potential for disturbance and displacement of species will be species dependant and can extend beyond the footprint of the array Potential for disturbance and displacement for guillemot and razorbill, not for the herring gull and kittiwake, could extend to a distance of 2 – 4 km beyond the array Potential for the scale of collision mortality to result in a population decline for kittiwake	Similar to and potentially less than those outlined in the construction phase.

Designated Site	Feature(s) screened in*	Potential for Likely Significant Effect		
		Construction	O&M	Decommissioning
			Screened in the HRA Screening Report drawing on the experience of CRM carried out for other consented OWFs	
Foulness (Mid-Essex Coast Phase 5) SPA	Sandwich tern	N/A	Potential for the scale of collision mortality to result in a population decline for Sandwich tern Screened in the HRA Screening Report drawing on the experience of CRM carried out for other consented OWFs	N/A
Alde-Ore Estuary SPA	Lesser black-backed gull	N/A	Potential for the scale of collision mortality to result in a population decline for lesser black-backed gull Screened in the HRA Screening Report drawing on the experience of CRM carried out for other consented OWFs	N/A
Alde-Ore Estuary Ramsar	Lesser black-backed gull	N/A	Potential for the scale of collision mortality to result in a population decline for lesser black-backed gull Screened in the HRA Screening Report drawing on the experience of CRM carried out for other consented OWFs	N/A

* Note that additional feature(s) may be included within the designation; however those detailed here are limited to the habitat and/ or species screened in for LSE.

8 The Screening Process for the Project In-combination

8.1 Overview to In-combination Screening

8.1.1 Regulation 63 of the Habitats Regulations includes a requirement for the Competent Authority to make the AA alone and in-combination with other plans or projects, where these are not directly connected with or necessary to the management of the site. Screening for the project alone is summarised in section 7, with screening for the project in-combination being provided here.

8.1.2 The legislation does not provide a definition of alone or in-combination. The following (not exhaustive) list has been applied to Thanet Extension when identifying plans and projects for consideration in-combination:

- Permitted ongoing activities, such as discharge consents and abstraction licences;
- Approved or consented plans which have not yet been completed;
- Plans and projects where the application for consent has been submitted but has not yet been approved by the competent authorities; and
- Plans and projects which are reasonably foreseeable, i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development being assessed and which sufficient information is available to adequately assess the likelihood of cumulative and in-combination effects.

8.1.3 A full review of such plans and projects has been conducted for Thanet Extension and reported in Volume 1, Annex 3-1: Cumulative Effects Assessment (Document Ref: 6.1.3.1). Each individual topic chapter for the ES has screened the full list of projects, plans and activities for consideration, to identify those relevant to individual receptor groups. The relevant plan/ project screening tables to the receptor groups within the RIAA are presented within the ES chapters as follows:

- Table 4.25 within Volume 2, Chapter 4: Offshore Ornithology (Document Ref: 6.2.4);
- Table 5.16 within Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Table 7.35 within Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7); and
- Table 5.14 within Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5).

8.1.4 In addition, through consultation (see Table 4.1) additional plans and projects have been highlighted in French waters. The projects highlighted were the OWFs of Fecamp (already included within the in-combination screening), Courseulles s/Mer (also referred to as Calvados or Parc eoliennes cour seules sur mer, and already included in in-combination screening), Dieppe-Le Treport (added to the screening process) and Dunkirk (added to the screening process).

8.1.5 With respect to in-combination effects within the HRA process, the Screening Report (Annex 1, Document Ref: 5.2.1) identified the broad categories of plans and projects to be considered within this RIAA. The specific plans and projects relevant to individual receptors draw on those identified within the individual ES chapters, as highlighted above. The intention of screening in-combination is to determine, for the plans and projects relevant to each receptor group, which of the designated sites screened in for determination of LSE alone may be affected by a spatial and/ or temporal overlap of effect from a relevant plan or project.

8.1.6 Further, it is acknowledged that the potential contribution to an AEoI in-combination by Thanet Extension could stem not only from those effects where LSE exists in relation to the project alone (as highlighted in Table 7.3 above), but also potentially from a *de minimis* aspect of the project alone that may become more relevant in-combination. As such, consideration has been given where the potential exists for Thanet Extension, to contribute to LSE in-combination, immaterial of whether an LSE alone applies or not.

8.1.7 The determination of LSE in-combination takes into account the following:

- Level of detail available for project/ plans;
- Potential for an effect-pathway-receptor link;
- Potential for a physical interaction; and
- Potential for temporal interaction.

8.1.8 The approach applied to screening in-combination is outlined below. The overall aim is to determine the plans or projects that may affect the designated sites considered for potential LSE for the project alone.

8.1.9 As is typical for an in-combination assessment, for many plans and projects there is uncertainty regarding project design and timeframe but also quantified environmental impacts. For this reason, in common with the ES, a Tiered approach has been applied to the in-combination assessment following the determination of LSE, with more detail on this approach provided below. The approach to the in-combination assessment for offshore ornithology follows the advice provided by Natural England and the description of that receptor specific approach is given under the offshore ornithology heading (section 8.5).

8.1.10 All relevant projects/ plans considered in-combination with Thanet Extension have been allocated into 'Tiers', reflecting their current stage within the planning and development process. This allows the in-combination impact assessment to consider several future development scenarios, each with a differing potential for being ultimately built out. Appropriate weight may therefore be given to each scenario (Tier) in the decision making process when considering the potential in-combination impact associated with Thanet Extension.

8.1.11 The tier structure presented below (for all receptors apart from offshore ornithology, which is presented separately) is intended to ensure that there is a clear understanding of the level of confidence in the in-combination assessment within the RIAA is as follows:

Tier 1

8.1.12 Thanet Extension considered alongside other projects/ plans already constructed or currently under construction and/ or those consented but not yet implemented, where data confidence in the project design envelope and timeline for construction is high. This means that these projects have a Contract for Difference (CfD) in place and/ or have commenced with the formal submission of discharge plans to the regulators, and therefore there can be confidence as to final scheme design and timing.

8.1.13 Built and operational projects will be included within this tier of the in-combination assessment where they have not been included within the environmental characterisation survey, i.e. they were not operational when baseline surveys were undertaken, and/ or any residual impact may not have yet fed through to and been captured in estimates of 'baseline' conditions.

Tier 2

8.1.14 Thanet Extension considered alongside other projects/ plans which are consented but not yet implemented, and where data confidence in the project design envelope and timeline for construction is medium. For example, the consented envelope may not be what is constructed, or timelines might have changed since the ES was submitted. The project may not yet proceed as a result of financial or other considerations. This Tier includes consented UK projects which have not yet been awarded a CfD.

Tier 3

8.1.15 Thanet Extension considered alongside other projects/ plans which have submitted applications but are not yet consented. The submitted application will have been accompanied by an ES but prior to any hearing or decision, there is the possibility that the design could change, and the project could be withdrawn or refused consent.

Tier 4

8.1.16 The above plus projects on relevant plans and programmes that have been announced by developers and that are listed on the appropriate planning systems (the PINS Programme of Projects and MMO 'Marine Case Management System' being the source most relevant for this assessment). Specifically, all projects where the developer has advised PINS in writing that they intend to submit an application in the future were considered.

8.1.17 It should be noted that Tier 4 has been added into the marine mammal assessment within the ES only, as a result of the necessity to differentiate the certainty in project envelope and timing for the impact of pile-driving in particular. It is difficult to generate a realistic schedule for the degree to which different projects might overlap in terms of piling periods. Therefore, another tier was added differentiating consented projects with more certainty in respect of project plans and timelines (e.g. where significant post-consent development and discussions have taken place) from those that have been consented but there is significant uncertainty as to when they will actually go ahead.

8.2 Subtidal and Intertidal Benthic Ecology

8.2.1 The initial step to screening for plans and projects in-combination for subtidal and intertidal benthic ecology receptors is to identify those plans and projects located within sufficient proximity to the relevant designated sites (based on a receptor specific screening range). Where plans and projects are identified, these will then be considered further to determine if LSE in-combination with Thanet Extension applies.

8.2.2 For subtidal and intertidal benthic habitats, the full list of plans and projects identified for cumulative assessment within Volume 2, Chapter 5 of the ES (Benthic Subtidal and Intertidal Ecology) are provided within Table 5.16 of that chapter. For the purposes of RIAA, these have been filtered, through the use of a Geographical Information System (GIS), to identify those plans and projects located within 14 km of one or more of the following designated sites (applying the maximum project specific screening range):

- Thanet Coast SAC;
- Margate and Long Sands SAC;
- Thanet Coast and Sandwich Bay SPA (in relation to intertidal habitats used by the designated features European golden plover and ruddy turnstone, with further comment provided in section 8.6 'onshore biodiversity' below); and
- Thanet Coast and Sandwich Bay Ramsar (in relation to intertidal habitats used by the designated feature, ruddy turnstone, with further comment provided in section 8.6 'onshore biodiversity' below).

8.2.3 The conclusions of that screening are provided in Table 8.1 below. Projects/ plans to be considered in-combination for specific designated sites are highlighted in grey bold.

Table 8.1: Summary Plans and Projects to be considered in-combination in relation to subtidal and/ or intertidal benthic habitats

Project/ Plan				Range to Designated Site			
Development Type	Project	Status	Tier	Thanet Coast SAC	Margate & Long Sands SAC	Thanet Coast & Sandwich Bay SPA	Thanet Coast & Sandwich Bay Ramsar
Cable installation	Nemo Interconnector Cable	In construction	1	< 1 km	8 km	0 km	0 km
Disposal area	Nemo Disposal Site B	Open	1	20 km	22 km	21 km	21 km
Disposal area	Nemo Disposal Site C	Open	1	1 km	10 km	2 km	2 km
Disposal area	Pegwell Bay	Open	2	1 km	10 km	3 km	3 km
Disposal area	Pegwell Bay B	Open	2	0 km	9 km	1 km	1 km
Disposal site	Ramsgate Harbour Site A	Open	2	0 km	9 km	1 km	1 km
Disposal site	Ramsgate Harbour Site B	Open	2	0 km	9 km	1 km	1 km

8.2.4 For the plans and projects highlighted above as being within sufficient proximity to the relevant designated sites, it is considered that there is potential for LSE in-combination with Thanet Extension. The potential for such an effect will vary, depending on parameters such as the timing of works and the nature of those works, with these to be considered in full in the determination of AEoI.

8.3 Marine Mammals

8.3.1 For marine mammals, screening in-combination has considered those designated sites where the potential for LSE was identified for the project alone. For all other designated sites, the distance is such that there is no pathway for effect from Thanet Extension to reach the designated site boundary and therefore no potential for an in-combination effect. The screening ranges applied vary between species and have been agreed with Natural England during the HRA Evidence Plan Process (see Table 4.1), being 26 km for harbour porpoise (JNCC, 2016), 120 km for harbour seal (SMRU, 2011) and 145 km for grey seal (Thompson *et al.* 1996). The ranges have been applied in GIS to each of the designated sites highlighted below to identify, from the full list of plans and projects identified for marine mammal cumulative assessment within the ES, together with the two additional projects highlighted during transboundary consultation, those to consider further for potential LSE in-combination with Thanet Extension. The screening therefore considers the following designated sites:

- Southern North Sea cSAC (harbour porpoise);
- Transboundary harbour porpoise site (Bancs de Flandres SCI);
- Transboundary harbour seal sites (Bancs de Flandres SCI, Baie de Canche et couloir des trois estuaires, Vlakte van de Raan, Voordelta, Estuaires et littoral picards (baies de Somme et d'Authie), Recifs Gris-Nez Blanc-Nez, Vlaamse Banken and Ridens et dunes hydrauliques); and
- Transboundary grey seal sites (Bancs de Flandres SCI, Baie de Canche et couloir des trois estuaires, Vlakte van de Raan, Voordelta, Estuaires et littoral picards (baies de Somme et d'Authie), Recifs Gris-Nez Blanc-Nez, Vlaamse Banken, Ridens et dunes hydrauliques, SBZ1, SBZ2 and SBZ3).

8.3.2 The potential for LSE has been determined based on the following:

- For a plan or project where there is potential for the construction period to have temporal overlap with that of Thanet Extension (i.e. the plan/ or project is identified by 'yes' in terms of construction window overlap in receptor specific chapters) OR the potential for construction overlap is unknown (i.e. the plan/ or project is identified by 'unknown' in terms of construction window overlap in receptor specific chapters) AND the plan/ or project is within the relevant species specific screening range of the designated site; and
- For a plan/ or project where there is no potential for temporal overlap with the construction period (i.e. the plan/ or project is identified by 'no' in terms of construction window overlap in receptor specific chapters), only those designated sites with physical overlap with the plan/ or project are screened in for LSE.

8.3.3 The differentiation between construction period and O&M period impacts is made here for marine mammals, in light of the typical scale of effects that may occur during construction compared to those during O&M (as evidenced by section 7.12 of Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7) of the ES).

8.3.4 It is acknowledged that other activity has the potential to contribute to an in-combination effect, specifically with regard to underwater noise. Previous assessments of AEoI on the SNS cSAC have included consideration of seismic survey associated with oil and gas activity, together with UXO detonations. Where seismic survey is known in association with the plans and projects identified in Table 8.1, these will be screened in for assessment. Given the timeframes involved (with offshore works at Thanet Extension due to start in 2021), the available information regarding planned oil and gas works¹² currently extends to mid 2019 only (website accessed May 2018) and therefore does not cover the required period, with no certainty regarding what or where (if anything) further applications would come forward in the relevant timeframe. It is therefore not possible to include such oil and gas works.

8.3.5 Similarly, as regards UXO clearance, where any planned works associated with projects screened in are known, these will be included within the assessment. As regards UXO clearance more widely, previous projects have considered ongoing UXO clearance, with OSPAR data providing a comprehensive source of information¹³.

¹² Sourced from <https://itportal.beis.gov.uk/eng/fox>

¹³ Information contained <https://www.ospar.org/work-areas/eiha/munitions> and data held http://odims.ospar.org/odims_data_files/

8.3.6 Data interrogation of the most recent OSPAR UXO data year available (2014) revealed that of the 653 munitions recorded in total in 2014, just five were found and detonated within 26 km of the SNS cSAC. Given the uncertainty regarding the ongoing requirement for such UXO clearance (previous investigations, via discussion with the Ministry of Infrastructure and the Environment in the Netherlands specifically Rijkswaterstaat, RWS, have revealed clearances in Dutch waters are anticipated to continue to decrease), together with uncertainty regarding the location of any such UXO and the timing of any such clearance (i.e. that for an in-combination effect to occur, a UXO would need to be found and detonated within 26 km of the SNS cSAC and on a day coinciding with the relevant season and with relevant activity being undertaken at Thanet Extension, with just 5 potentially relevant UXO noted for the whole of 2014), the potential for UXO clearance across the OSPAR region to contribute to an AEoI on the SNS cSAC in-combination is deemed to be both very low risk and *de minimis*. The tier most relevant to such clearance is Tier 4. Any such clearance cannot be associated with a specific designated site and are therefore not included in Table 8.2 below.

Table 8.2: Summary of Plans and Projects screened in for the marine mammal assessment in-combination

Project/ Plan				Range to Designated Site (screening range in km)																				
Type	Project	Overlap with construction	Tier	Harbour Porpoise Sites (26 km)		Grey seal sites (145 km)										Harbour seal sites (120 km)								
				SNS cSAC	SCI	Bancs de Flandres	Bancs des Flandres	Recifs Gris-Nez Blanc-Nez	Baie de Canche et couloir des trois	Vlakte van de Raan	Vlakte van de Raan	Estuaires et littoral picards	Vlaamse Banken	Voordelta	SBZ 1	SBZ 2	SBZ 3	Ridens et dunes hydrauliques	Bancs des Flandres	Baie de Canche et couloir des trois	Vlakte van de Raan	Voordelta	Estuaires et littoral picards	Recifs Gris-Nez Blanc-Nez
Offshore wind farm	Borssele 1 & 2, 3 & 4, 5 ¹⁴	Yes	1	21	> 26	58	120	> 145	34	> 145	34	27	56	39	28	134	58	> 120	34	27	> 120	120	34	> 120
	Dieppe le Treport	Unknown	3	>26	>26	113	74	18	>145	21	>145	>145	>145	>145	>145	30	113	18	>120	>120	21	74	>120	30
	Dogger Bank Creyke Beck A & B	Yes	2	0	> 26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
	Dogger Bank Teesside A	Yes	2	24	> 26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
	Sofia ¹⁵	Yes	2	0	>26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
	Dunkirk ¹⁶	Unknown	4	>26	0	0	53	85	65	102	7	143	11	28	53	73	0	85	65	>120	102	53	7	73
	East Anglia Norfolk Boreas	No	4	0	> 26	> 145	> 145	> 145	> 145	> 145	> 145	118	> 145	> 145	> 145	> 145	> 120	> 120	> 120	118	> 120	> 120	> 120	> 120

¹⁴ Note that Borssele consists of separate projects however all are located within the same zone and all are planned to construct in the same year – for practical purposes therefore these have all been considered as a single project

¹⁵ Sofia was previously known as Dogger Bank Teesside B and has been renamed

¹⁶ Note that there is significant uncertainty regarding the location of the Dunkirk project, with a centre point location only available. There is, therefore, the possibility that, once a project boundary is available, that the project would be within 26km of the SNScSAC. However at present, insufficient data is available to enable this to be determined.

Project/ Plan				Range to Designated Site (screening range in km)																				
Type	Project	Overlap with construction	Tier	Harbour Porpoise Sites (26 km)		Grey seal sites (145 km)										Harbour seal sites (120 km)								
				SNS cSAC	Bancs de Flandres SCI	Bancs des Flandres	Recifs Gris-Nez Blanc-Nez	Baie de Canche et couloir des trois	Vlakte van de Raan	Vlakte van de Raan	Estuaires et littoral picards	Vlaamse Banken	Voordelta	SBZ 1	SBZ 2	SBZ 3	Ridens et dunes hydrauliques	Bancs des Flandres	Baie de Canche et couloir des trois	Vlakte van de Raan	Voordelta	Estuaires et littoral picards	Recifs Gris-Nez Blanc-Nez	Vlaamse Banken
	Norfolk Vanguard East	Yes	4	0	> 26	> 145	> 145	> 145	> 145	> 145	> 145	106	> 145	> 145	> 145	> 145	> 120	> 120	> 120	106	> 120	> 120	> 120	> 120
	Norfolk Vanguard West	Yes	4	0	> 26	> 145	> 145	> 145	> 145	> 145	> 145	131	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
	East Anglia ONE	No	1	0	> 26	76	118	> 145	80	> 145	52	73	87	76	82	> 145	76	> 120	80	73	> 120	118	52	> 120
	East Anglia ONE North	Unknown	4	0	> 26	110	> 145	> 145	109	> 145	87	93	122	110	113	> 145	110	> 120	109	93	> 120	> 120	87	> 120
	East Anglia TWO	Unknown	4	0	> 26	82	123	> 145	89	> 145	59	84	94	84	92	132	82	> 120	89	84	> 120	> 120	59	> 120
	East Anglia THREE	Yes	2	0	> 26	136	> 145	> 145	121	> 145	112	95	143	128	126	> 145	> 120	> 120	> 120	95	> 120	> 120	112	> 120
	Fecamp – Seine-Maritime	Yes	2	> 26	> 26	> 145	131	87	> 145	87	> 145	> 145	> 145	> 145	> 145	65	> 120	87	> 120	> 120	87	> 120	> 120	65
	Hollandse Kust noord 1	Unknown	2	> 26	> 26	> 145	> 145	> 145	> 145	> 145	> 145	66	> 145	> 145	> 145	> 145	> 120	> 120	> 120	66	> 120	> 120	> 120	> 120
	Hollandse Kust noord 2	Unknown	2	> 26	> 26	> 145	> 145	> 145	> 145	> 145	> 145	64	> 145	> 145	> 145	> 145	> 120	> 120	> 120	64	> 120	> 120	> 120	> 120
	Hollandse Kust zuid 1 & 2	Unknown	3	> 26	> 26	> 145	> 145	> 145	94	> 145	125	20	141	118	103	> 145	> 120	> 120	94	20	> 120	> 120	> 120	> 120
	Hollandse Kust zuid 3 & 4	Unknown	3	> 26	> 26	> 145	> 145	> 145	96	> 145	125	22	142	119	104	> 145	> 120	> 120	96	22	> 120	> 120	> 120	> 120
	Hornsea Project ONE	Yes	1	0	> 26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120

Project/ Plan				Range to Designated Site (screening range in km)																				
Type	Project	Overlap with construction	Tier	Harbour Porpoise Sites (26 km)		Grey seal sites (145 km)										Harbour seal sites (120 km)								
				SNS cSAC	Bancs de Flandres SCI	Bancs des Flandres	Recifs Gris-Nez Blanc-Nez	Baie de Canche et couloir des trois	Vlakte van de Raan	Estuaires et littoral picards	Vlaamse Banken	Voordelta	SBZ 1	SBZ 2	SBZ 3	Ridens et dunes hydrauliques	Bancs des Flandres	Baie de Canche et couloir des trois	Vlakte van de Raan	Voordelta	Estuaires et littoral picards	Recifs Gris-Nez Blanc-Nez	Vlaamse Banken	Ridens et dunes hydrauliques
	Hornsea Project TWO	Yes	1	0	> 26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
	Hornsea Project THREE	Yes	4	1	> 26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
	Mermaid	Unknown	2	18	> 26	47	108	145	38	> 145	23	36	48	34	39	124	47	> 120	38	36	> 120	108	23	> 120
	Seastar	Unknown	2	> 26	> 26	46	108	144	29	> 145	22	26	44	28	31	124	46	> 120	29	26	> 120	108	22	> 120
	Triton Knoll	Yes	1	21	> 26	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 145	> 120	> 120	> 120	> 120	> 120	> 120	> 120	> 120
Cable	Nemo Link	No	1	0	0	0	35	80	11	> 145	0	25	14	0	0	40	0	80	11	25	80	35	0	40

8.4 Diadromous Fish

- 8.4.1 Screening for LSE alone highlighted a single designated site, Vlaamse Banken, located at least 39 km from the array area. No other sites were identified, for which migratory fish are listed as a feature, with the screening range applied being 55 km (see Table 7.3 of the Screening Report (Document Ref: 5.2.1) for justification of that range). The range applied is considered highly precautionary, with the assessment alone concluding no LSE for migratory fish species. Of the plans and projects screened in for cumulative assessment within Table 6.15 of Volume 2, Chapter 6: Fish and Shellfish Ecology (Document Ref: 6.2.6), chapter from the ES, the majority are disposal grounds together with a cable installation (Nemo) and East Anglia ONE (offshore construction in 2018). Of these, none are considered to have the potential to give rise to an effect with potential for sufficient physical and/ or temporal interaction with effects associated with Thanet Extension to result in an in-combination effect; to do so, the effects would either need to reach the designated site and/ or occur within the relevant timetable for offshore construction of Thanet Extension (offshore construction to start 2021, UXO clearance and geophysical survey to predate that).
- 8.4.2 Therefore, designated sites for diadromous sites are screened out of in-combination assessment.

8.5 Offshore Ornithology

- 8.5.1 For offshore ornithology the approach to 'tiers' follows the advice of Natural England and accounts for the discussions held during the Evidence Plan process. It is based on the approach initially recommended by JNCC and Natural England in the consenting process for East Anglia ONE OWF (JNCC and Natural England, 2013) and subsequently taken forward in other recent OWF assessments as a 'five tier approach'. These five tiers are categorised along with consideration about the certainty of the assessment and relevant data available in Table 8.3.

Table 8.3: Tiering applied to plans and projects screened in for in-combination assessment of offshore ornithology

Tier	Description	Availability of information about the assessment and associated data and level of confidence
Tier 1	Built and operational projects	<p>To gain consent the developer will have submitted an ES, potentially supplementary information and, in the case of NSIP developments, additional information during the course of the Hearing. There may also be post-construction monitoring information.</p> <p>Any variation in project design (within the scope of the Rochdale Envelope) will have been decided.</p> <p>With regard to impact induced mortality of birds, this effect, even though arising from an operational project, may not have yet fed through to, and been captured in, estimates of “baseline” population conditions i.e. the background distribution and/ or mortality rate of birds. Accordingly, such projects are included within the in-combination assessment rather than excluded on the basis that they are part of the baseline/ background.</p> <p>High confidence</p>
Tier 2	Projects that are under construction	<p>To gain consent the developer will have submitted an ES, potentially supplementary information and, in the case of NSIP developments, additional information during the course of the Hearing.</p> <p>Any variation in project design (within the scope of the Rochdale Envelope) will have been decided.</p> <p>High confidence</p>
Tier 3	Consented applications not yet implemented	<p>To gain consent the developer will have submitted an ES, potentially supplementary information and, in the case of NSIP developments, additional information during the course of the Hearing.</p> <p>The consented project design may not be the one that is constructed and a reduced scale project (i.e. within the scope of the Rochdale Envelope) might be implemented.</p> <p>The consented project may not yet proceed because of financial or other considerations.</p> <p>Medium confidence</p>

Tier	Description	Availability of information about the assessment and associated data and level of confidence
Tier 4	Submitted applications not yet determined	<p>The submitted application will have been accompanied by an ES but prior to the decision there is still the possibility that supplementary information and, in the case of NSIP developments, additional submissions during the course of the Hearing will be provided that contains significant changes to predicted impacts.</p> <p>The proposed project might be withdrawn or consent refused.</p> <p>Low confidence</p>
Tier 5	Future [foreseeable] projects	<p>Projects that have been announced by the developer, projects that are listed in the PINS programme of projects and projects that are at the pre-scoping and scoping stage will not have any published assessment or data available about impacts.</p> <p>The proposed project might not progress to an application for consent.</p> <p>Low confidence</p>

8.5.2 This approach with five tiers for offshore ornithology differs from that applied for other interest features. Natural England (2014) has argued that a higher number of tiers provide for a better resolution of the different stages that different projects are at in their lifecycle. The five tier approach still differentiates between those projects with high, medium and low confidence in the data that is applied in a three or four tier approach for other interest features. Both allow the decision maker to give more weight to those projects for which there is higher confidence in the data.

8.5.3 The projects and plans selected as relevant to the assessment of impacts to offshore ornithology are based upon an initial screening exercise undertaken on a long list (HRA Screening Report). This long list included a wide range of different types of activity including marine aggregate extraction, port dredging disposal, other OWFs, oil and gas extraction, cables (including those from OWFs), pipelines, shipping, coastal developments and commercial fisheries. Each project, plan or activity has been considered and scoped in or out on the basis of effect–receptor-pathway, data confidence and the temporal and spatial scales involved.

- 8.5.4 Projects related to marine aggregate extraction, port dredgings disposal, oil and gas extraction, pipelines, shipping, coastal developments and commercial fisheries have been screened out on a series of factors including those that do not overlap spatially with Thanet Extension, those that do not give rise to effects that are cumulative with relevant effects from Thanet Extension, those that are recurring or ongoing from before the baseline period and those that are ongoing activities rather than projects with a consenting process.
- 8.5.5 Two categories of project have been screened in for in-combination assessment: OWFs and offshore cables. For these two categories consideration has to be given to the types of impact that might result in in-combination impact. The following three types of in-combination impact, by project category, are considered:
- Offshore cables construction phase direct disturbance and displacement;
 - OWFs O&M phase direct disturbance and displacement; and
 - OWFs O&M phase collision risk
- 8.5.6 The specific projects scoped into this in-combination assessment, and the tiers into which they have been allocated are presented in Table 8.4. The list of projects in the table is first divided by project type (offshore wind farm and offshore cable) and then listed alphabetically within each tier. Within Tier 4 those projects that are at the PEIR stage are identified from those at the later ES stage in response to comments from stakeholders that this particular phase in the application process be identified in the table of tiers.

Table 8.4: Projects included in the in-combination assessment

Development type	Project	Status	Data confidence assessment/ phase	Tier
Offshore Wind Farm	Beatrice Demonstrator	Built, formerly operational but at present out of commission	High: Data in applicant's ES	1
Offshore Wind Farm	Blyth	Built, formerly operational but at present out of commission	High: Data in applicant's ES	1
Offshore Wind Farm	Blyth Demonstrator Array 2	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Dudgeon	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Galloper	Fully constructed but not commissioned	High: Data in applicant's ES	1
Offshore Wind Farm	Greater Gabbard	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Gunfleet Sands I & 2	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Humber Gateway	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Hywind	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Kentish Flats	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Kentish Flats Extension	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Lincs	Operational	High: Data in applicant's ES	1

Development type	Project	Status	Data confidence assessment/ phase	Tier
Offshore Wind Farm	London Array	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Lynn and Inner Dowsing	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Race Bank	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Rampion	Fully constructed but not commissioned	High: Data in applicant's ES	1
Offshore Wind Farm	Scroby Sands	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Sheringham Shoal	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Teesside	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Thanet	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Westermost Rough	Operational	High: Data in applicant's ES	1
Offshore Wind Farm	Beatrice	Under construction	High: Data in applicant's ES	2
Offshore Wind Farm	East Anglia ONE	Under construction	High: Data in applicant's ES	2
Offshore Wind Farm	EOWDC [Aberdeen]	Under construction	High: Data in applicant's ES	2
Offshore Wind Farm	Hornsea Project One	Under construction	High: Data in applicant's ES	2

Development type	Project	Status	Data confidence assessment/ phase	Tier
Offshore Wind Farm	Dogger Bank Creyke Beck Projects A and B	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Dogger Bank Teesside Project A	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Firth of Forth (Seagreen) Alpha and Bravo	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Hornsea Project Two	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Inch Cape	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Kincardine	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Moray Firth (Eastern DA)	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Neart na Gaoithe	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Sofia (Dogger Bank Teesside B)	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	Triton Knoll	Consented but not implemented	Medium: Data in applicant's ES but design might change	3
Offshore Wind Farm	East Anglia THREE	Consented but not implemented	Low: Data in applicant's ES but design might change	3

Development type	Project	Status	Data confidence assessment/ phase	Tier
Offshore Wind Farm	Hornsea Project 3	Pre-application (PEIR issued)	Low: PEIR data available	4
Offshore Wind Farm	Norfolk Vanguard	Pre-application (PEIR issued)	Low: PEIR data available	4
Offshore Wind Farm	East Anglia ONE North	Pre-application (Scoping Report submitted)	Low: Scoping Report data available	5
Offshore Wind Farm	East Anglia TWO	Pre-application (Scoping Report submitted)	Low: Scoping Report data available	5
Offshore Wind Farm	Moray Firth (Western DA)	Pre-application (Scoping Report submitted)	Low: Scoping Report data available	5
Offshore Wind Farm	Norfolk Boreas	Pre-application (Scoping Report submitted)	Low: Scoping Report data available	5
Offshore Cable	Nemo Link (UK-Belgium interconnector)	Under construction	High: Data in applicant's ES	3

- 8.5.7 Uncertainty arises with a number of OWF projects in Scotland whose progress has been delayed through being the subject of court action (Inch Cape, Neart na Gaoithe, Seagreen Alpha and Seagreen Bravo). The decision of the UK Supreme Court in November 2017 not to allow RSPB to appeal the consents means that the consents are valid and the developments could progress with the consented design. It is the predictions in the ES’s for those designs that have been included in the in-combination assessment. In the meantime, the developers of these wind farms (Inch Cape, Neart na Gaoithe and a combined Seagreen Alpha and Seagreen Bravo proposal called Seagreen Phase 1) have submitted applications to the Scottish Government for revised proposals that are, broadly, for a smaller number of larger WTGs. In addition, a further Scottish consented OWF, Moray East, has submitted a Scoping Report that is for a development of a smaller number of larger WTGs. It can be expected that project design changes will result in changes to the scale of impacts predicted. At present the consented projects fall in to Tier 3. Should a new application be submitted for any of these projects and it is made clear that the previous consented application will not be implemented, then such projects will move to Tier 4.
- 8.5.8 The projects screened in for potential in-combination effects with Thanet Extension and the relevant SPA/ pSPA/ Ramsar sites and their interest features are presented, in Table 8.5 and Table 8.6, for offshore cables construction phase direct disturbance and displacement; offshore wind farms operational phase direct disturbance and displacement; and OWFs operational phase collision risk respectively.
- 8.5.9 The approach taken to considering where the potential impacts fall resulting from in-combination effects differs between that for offshore cables and that for OWFs in their operational phase.
- 8.5.10 The approach taken for offshore cables considers the potential spatial and temporal coincidence of offshore cable construction in an area around the proposed Thanet Extension and how that in-combination might affect SPA/ pSPA/ Ramsar sites in that area. This is reflected in the list of designated sites presented in Table 8.7.

- 8.5.11 The approach taken for OWFs in their operational phase differs because it considers the in-combination effect of constructed and proposed OWFs along the eastern coast of Britain, totals the potential impacts for specific interest features and then apportions that total amongst designated sites. This approach is required in order to account for the mobile nature of seabirds, with birds breeding at colony SPAs at some considerable distance but then a proportion of those breeding birds potentially occurring in the non-breeding season in and around Thanet Extension.
- 8.5.12 For disturbance and displacement in-combination effects the assessment considers those SPA/ pSPA/ Ramsar sites with non-breeding red-throated diver as an interest feature which can be associated with the population of non-breeding red-throated diver that occurs within and adjacent to the proposed Thanet Extension. The site considered is the Outer Thames Estuary SPA.
- 8.5.13 The potential for disturbance and displacement in-combination effects on guillemot and razorbill during the non-breeding season on SPA/ pSPA/ Ramsar sites with these two auk species as breeding interest features (Flamborough and Filey Coast pSPA, Northumberland Marine SPA, Farne Islands SPA and St Abb’s Head to Fast Castle SPA) has not been included in the assessment because the numbers potentially displaced that can be attributed to these colonies will not make a significant contribution to the in-combination assessment. This can be evidenced by way of example for guillemot from the Flamborough and Filey Coast pSPA. The total number guillemots occurring on an annual basis (i.e. across all four seasons) within the Thanet Extension site was 986 individuals and in a 1 km buffer surrounding Thanet Extension it was 449 individuals. Applying the site based evidence for 70% displacement within an operating wind farm and 25% displacement around an operating wind farm then an estimated 690 and 112 individuals, or 802 in total, may be subject to potential displacement. Within this number of birds, those that can be attributed to the Flamborough and Filey Coast pSPA is in proportion to the number from the pSPA to the number in the UK North Sea non-breeding BDMPS. Furness (2015) identifies that the Flamborough and Filey Coast pSPA supports 79,282 adult birds, that 90% of these stay in UK North Sea waters outside the breeding season and that the total number of birds in UK North Sea waters outside the breeding season is 1,617,306, of which 955,860 are adult birds. Of the 802 in total that may be subject to potential displacement, the number of birds that can be apportioned to the Flamborough and Filey Coast pSPA is only 35 adult birds. Applying the consequential mortality rates of 1% or 5% leads to a predicted mortality contribution of less than one and two adult birds respectively.
- 8.5.14 For collision risk, the assessment considers SPA/ pSPA/ Ramsar sites with breeding gannet, kittiwake and lesser black-backed gull as interest features. These sites are (noting that not all sites have all of the seabird species listed as interest features): Alde-Ore Estuary SPA, Alde-Ore Estuary Ramsar site, Flamborough Head and Bempton Cliffs SPA, Flamborough and Filey Coast pSPA, Northumberland Marine SPA, Farne Islands SPA and St Abb’s Head to Fast Castle SPA.

Table 8.5: Projects included in the in-combination assessment of offshore cable construction phase direct disturbance and displacement

Project			Distance to Designated Site (km)
Offshore Cable Project	Status	Tier	Outer Thames Estuary SPA
Nemo Link (UK-Belgium interconnector)	Under construction	3	7

Table 8.6: Projects included in the in-combination assessment of OWF O&M phase direct disturbance and displacement

Offshore Wind Farm Project	Status	Tier
Beatrice Demonstrator	Built, formerly operational but at present out of commission	1
Blyth	Built, formerly operational but at present out of commission	1
Blyth Demonstrator Array 2	Operational	1
Dudgeon	Operational	1
Galloper	Operational	1
Greater Gabbard	Operational	1
Gunfleet Sands I & 2	Operational	1
Hywind	Operational	1
Humber Gateway	Operational	1
Kentish Flats	Operational	1
Kentish Flats Extension	Operational	1
Lincs	Operational	1
London Array	Operational	1
Lynn and Inner Dowsing	Operational	1
Race Bank	Operational	1
Rampion	Fully constructed but not commissioned	1
Scroby Sands	Operational	1
Sheringham Shoal	Operational	1
Teesside	Operational	1
Thanet	Operational	1

Offshore Wind Farm Project	Status	Tier
Westermost Rough	Operational	1
Beatrice	Under construction	2
East Anglia ONE	Under construction	2
EOWDC [Aberdeen]	Under construction	2
Hornsea Project One	Under construction	2
Dogger Bank Creyke Beck Projects A and B	Consented but not implemented	3
Dogger Bank Teesside Project A	Consented but not implemented	3
Firth of Forth (Seagreen) Alpha and Bravo	Consented but not implemented	3
Hornsea Project Two	Consented but not implemented	3
Inch Cape	Consented but not implemented	3
Kincardine	Consented but not implemented	3
Moray Firth (Eastern DA)	Consented but not implemented	3
Near na Gaoithe	Consented but not implemented	3
Sofia (Dogger Bank Teesside B)	Consented but not implemented	3
Triton Knoll	Consented but not implemented	3
East Anglia THREE	Consented but not implemented	3
Hornsea Project 3	Pre-application (PEIR issued)	4
Norfolk Vanguard	Pre-application (PEIR issued)	4

Table 8.7: Projects included in the in-combination assessment of OWF O&M phase collision risk

Offshore Wind Farm Project	Status	Tier
Beatrice Demonstrator	Built, formerly operational but at present out of commission	1
Blyth	Built, formerly operational but at present out of commission	1
Blyth Demonstrator Array 2	Operational	1
Dudgeon	Operational	1
Galloper	Operational	1
Greater Gabbard	Operational	1
Gunfleet Sands I & 2	Operational	1
Hywind	Operational	1
Humber Gateway	Operational	1
Kentish Flats	Operational	1
Kentish Flats Extension	Operational	1
Lincs	Operational	1
London Array	Operational	1
Lynn and Inner Dowsing	Operational	1
Race Bank	Operational	1
Rampion	Fully constructed but not commissioned	1
Scroby Sands	Operational	1
Sheringham Shoal	Operational	1
Teesside	Operational	1
Thanet	Operational	1

Offshore Wind Farm Project	Status	Tier
Westermost Rough	Operational	1
Beatrice	Under construction	2
East Anglia ONE	Under construction	2
EOWDC [Aberdeen]	Under construction	2
Hornsea Project One	Under construction	2
Dogger Bank Creyke Beck Projects A and B	Consented but not implemented	3
Dogger Bank Teesside Project A	Consented but not implemented	3
Firth of Forth (Seagreen) Alpha and Bravo	Consented but not implemented	3
Hornsea Project Two	Consented but not implemented	3
Inch Cape	Consented but not implemented	3
Kincardine	Consented but not implemented	3
Moray Firth (Eastern DA)	Consented but not implemented	3
Nearr na Gaoithe	Consented but not implemented	3
Sofia (Dogger Bank Teesside B)	Consented but not implemented	3
Triton Knoll	Consented but not implemented	3
East Anglia THREE	Consented but not implemented	3
Hornsea Project 3	Pre-application (PEIR issued)	4
Norfolk Vanguard	Pre-application (PEIR issued)	4

8.6 Onshore Biodiversity

8.6.1 The projects and plans selected as relevant to the in-combination assessment for onshore biodiversity are based upon an initial screening exercise undertaken as part of the EIA. The full list of plans and projects identified during this screening exercise is provided in Volume 3, Chapter 5, Onshore Biodiversity (Document Ref: 6.3.5; Table 5.12). For the purposes of the RIAA, as set out in the screening report, the in-combination assessment includes projects:

- Which are located within 5 km of the RLB; and
- Have the potential to have an in-combination effect on the European sites for which LSE have been identified for Thanet Extension alone, i.e. Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar.

8.6.2 In respect of the qualifying features of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar the following types of other development could give rise to in-combination effects:

- Other developments which could result in loss or change (permanent and/ or temporary) to habitats used by non-breeding European golden plover or ruddy turnstone. This could include developments affecting functionally linked habitats outside the European site boundaries;
- Other developments which could result in loss or change (permanent and/ or temporary) to terrestrial habitats supporting any of the three wetland invertebrate assemblage species *Didineis lunicornis*, *Ectemnius ruficornis* and *Eluma caelata*. It is assumed that the Ramsar population of these species is effectively restricted to the land within the Ramsar site itself. Other developments with the potential to affect these species would therefore have to be located within or immediately adjacent to the Ramsar site;
- Other developments which could result in the displacement of recreational users, who could potentially be displaced into areas where they could cause disturbance to non-breeding European golden plover and ruddy turnstone; and
- Other developments which could result in visual or noise disturbance to non-breeding European golden plover or ruddy turnstone. This could include disturbance to qualifying features using functionally linked habitats outside the European site boundaries.

8.6.3 Each project, plan or activity identified in Table 5.14 of Volume 3, Chapter 5, Onshore Biodiversity (Document Ref: 6.3.5) has been considered and screened in or out on the basis of effect–receptor pathway, data confidence and the temporal and spatial scales involved. Projects which are considered to have potential to give rise to in-combination effects, and are therefore screened in, are highlighted in Table 8.8. The potential for in-combination effects will vary, depending on parameters such as the timing and nature of the proposed works, with these to be considered in full in the determination of AEoI.

Table 8.8: Plans and Projects for Consideration In-Combination with Thanet Extension for Onshore Biodiversity

Development type	Project	Status	Data confidence assessment/ phase	Tier
Biomass combined heat and power (CHP) plant	Biomass CHP Plant, Discovery Park, Sandwich	In construction	High - Third party project details published in the public domain.	Tier 1
Mixed use development	Mixed use development, Discovery Park, Sandwich	Consented	High - Third party project details published in the public domain.	Tier 1
Transmission connection between Richborough and Canterbury	Richborough Connection Project	DCO granted	High - Third party project details published in the public domain.	Tier 1
Transmission connection – cabling and substation	Nemo Link	In construction	High - Third party project details published in the public domain.	Tier 1
Airport	Manston Airport Upgrading and Re-opening	Application submitted and then withdrawn in May 2018. A revised application is likely, although timescales are not known.	Low – limited project details in the public domain	Tier 4

- 8.6.4 All other projects identified in Table 5.14 of Volume 3, Chapter 5, Onshore Biodiversity (Document Ref: 6.3.5) are considered unlikely to have in-combination effects. Projects have primarily been screened out of consideration in the in-combination assessment due to their distance from the Thanet Coast and Sandwich Bay SPA / Thanet Coast and Sandwich Bay Ramsar and/or their distance from functionally linked habitat used by European golden plover or ruddy turnstone. Proximity to functionally linked habitat for European golden plover and ruddy turnstone has been determined through consideration of survey information submitted for the other developments and/or the results of a survey of European golden plover carried out during the winter of 2016/2017 (Sutherland, 2017).
- 8.6.5 In response to potential increases in recreational pressure, TDC has produced a Strategic Access Management & Monitoring Plan (SAMM) in respect of the Thanet Section of the Thanet Coast & Sandwich Bay SPA. Residential development within 6 km of the SPA is expected to make financial contributions to the implementation of the SAMM in order to mitigate potential disturbance to SPA qualifying features from increased recreational pressure (which may result from increases in population associated with new residential development). For the purposes of this in-combination assessment it is assumed that developer contributions to the SAMM will effectively mitigate possible indirect effects resulting from increased recreational pressure. Residential development which is not likely to have a direct effect on SPA qualifying features is therefore excluded from the in-combination assessment.
- 8.6.6 Consideration of the potential for an in-combination effect on the intertidal habitats of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar is addressed as part of the intertidal benthic in-combination assessment, including a conclusion regarding the implications for the designated features of those sites, specifically the ruddy turnstone (Thanet Coast and Sandwich Bay Ramsar & SPA) and European golden plover (Thanet Coast and Sandwich Bay SPA).

9 Summary of Designated Sites

9.1.1 Summary information on each designated site screened in for LSE alone and/ or in-combination is provided below, including the designated feature(s), key literature sources describing the site and the features/ effects screened in under LSE. The conservation objectives for each site are also provided.

9.2 Thanet Coast SAC

9.2.1 The Thanet Coast SAC was designated in 2005 and covers some 2,815.95 ha¹⁷ of primarily marine habitat along a stretch of approximately 23 km of chalk cliff coastline. The receptor group 'subtidal benthic habitats' is relevant to the Thanet Coast SAC. Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2);
- Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 5-2: Benthic Ecology – Subtidal Technical Report (Document Ref: 6.4.5.2);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8);
- North east Kent European Marine Site Regulation 33 Advice (Natural England, 2000);
- Citation for Special Area of Conservation: Thanet Coast SAC (Natural England, 2005); and
- Condition assessment of Thanet Coast Special Area of Conservation (Natural England, 2015).

9.2.2 The site is designated for the following Annex I habitats:

- Chalk reefs; and
- Submerged or partially submerged sea caves.

9.2.3 Thanet coast holds the longest continuous stretch of coastal chalk in the UK, hosting 20% of UK chalk reefs and 12% of European chalk reefs. Infralittoral kelp forests are absent on the coast, due to the high turbidity of water, however there is an unusually rich littoral algal flora (Natural England, 2015). Natural England (2000) also found that the chalk reef communities are strongly influenced by the naturally turbid seawater. There are a number of sub-features to the site (Natural England, 2000), including the following:

- Intertidal chalk cliff algal and lichen communities, occurring around the high water mark and splash zone;
- Intertidal red algal turfs communities, being widespread on the lower to mid shore reef;
- Kelp dominated communities on animal bored rock, the distribution of which being heavily influenced by the turbid water; and
- Subtidal animal bored chalk communities, being widespread throughout the subtidal part of the site.

9.2.4 The coastline provides the second most extensive representation of chalk caves in the UK, with some submerged calves extending up to 30 m into the cliffs and reaching 6 – 10 m in height. The caves support a specialised algal and lichen community. As for the chalk reef feature, there is a sub-feature (Natural England, 2000), specifically:

- Intertidal chalk cliff algal and lichen communities, occurring at and around the high water mark.

9.2.5 A Site Improvement Plan (SIP) for North East Kent (Thanet) was published in 2014¹⁸. With respect to the designated features of Thanet Coast SAC, the SIP raised the following pressures or threats:

- Invasive species (notably Pacific pyster (*Crassostrea gigas*));
- Public access/ disturbance; and
- Commercial marine and estuarine fisheries.

¹⁷ <http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013107>

¹⁸ <http://publications.naturalengland.org.uk/file/6055004372729856>

9.2.6 Table 7.3 found potential for LSE for the chalk reef feature only, both during construction and O&M, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase. The potential for LSE can be summarised as follows:

- Habitat loss and habitat disturbance (construction and O&M);
- Temporary increases in SSCs, deposition of sediments and smothering (construction and O&M);
- Changes to physical processes (O&M); and
- EMF (O&M).

9.2.7 No Supplementary Advice has been sourced for the Thanet Coast SAC, and as such no determination of the current conservation status of the designated features is available¹⁹. However, The Conservation Objectives for the site²⁰ as made in 2014 are available as follows:

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

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

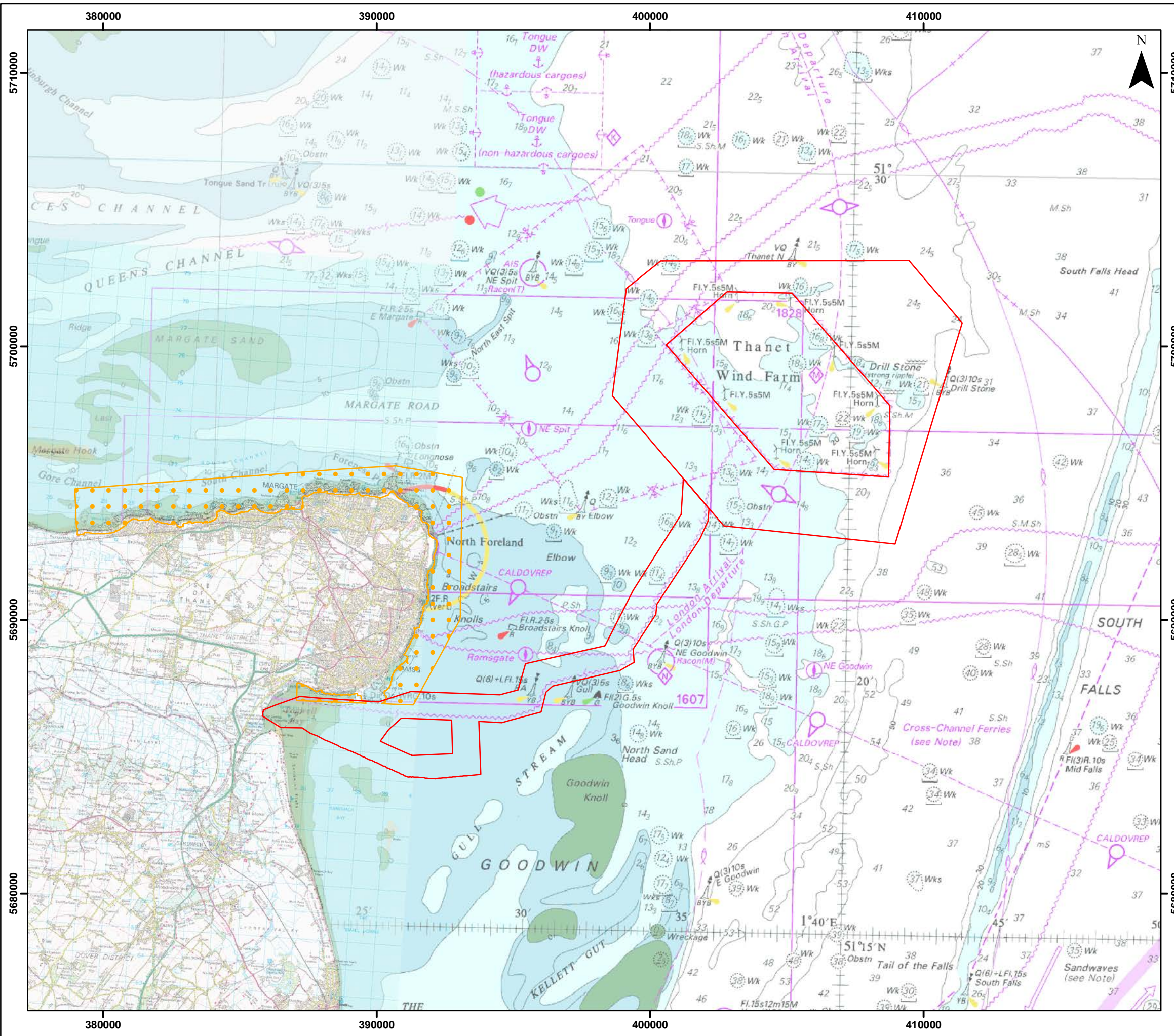
¹⁹ <http://publications.naturalengland.org.uk/publication/5766780467281920>

²⁰ <http://publications.naturalengland.org.uk/file/6264865140244480>

THANET EXTENSION OFFSHORE WIND FARM

Figure 9.1
Thanet Coast SAC in Relation to Thanet Extension

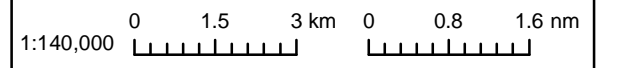
- Legend**
- Offshore Red Line Boundary
 - Thanet Coast SAC



Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.1_ThanetCoastSAC			Figure 9.1
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

9.3 Margate and Long Sands SAC

9.3.1 The Margate and Long Sands SAC was formally submitted as a cSAC in 2010 and became an SAC in September 2017. The SAC covers some 64,876.85 ha²¹ of marine habitat. The receptor group 'subtidal benthic habitats' is relevant to the Margate and Long Sands SAC. Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2);
- Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 5-2: Benthic Ecology – Subtidal Technical Report (Document Ref: 6.4.5.2);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8);
- Natural England website²²
- Margate and Long Sands Candidate Special Area of Conservation formal Advice under Regulation 35(3) (Natural England, 2012);
- Inshore Special Area of Conservation (SAC): Margate and Long Sands SAC Selection Assessment (Natural England, 2010); and
- Margate and Long Sands Natura 2000 Standard Data Form (JNCC, 2011).

9.3.2 The site is designated for the following Annex I habitat:

- Sand banks which are slightly covered with seawater all the time.

9.3.3 The sand bank habitat of the Margate and long Sands SAC can be divided into subfeatures, as follows:

- Dynamic sand communities; and
- Gravelly muddy sand communities.

9.3.4 The site contains a number of the sand bank features, the largest being Long Sands. The sand banks are typically composed of well sorted sandy sediments, with muddier and more gravelly sediments in the troughs. The upper crests of some banks dry at low water. The fauna of the bank crests is characteristic of species-poor, mobile sand environments, with the troughs and slopes having a higher diversity of benthic species. In addition to the sand bank features, the Regulation 35 advice also notes the presence of *Sabellaria spinulosa* at the site; however, the distribution is understood to be patchy and forming crusts rather than reefs, with biogenic reefs not listed as a qualifying feature.

9.3.5 Table 7.3 found potential for LSE, both during construction and O&M, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase. The potential for LSE can be summarised as follows:

- Temporary increases in SSCs, deposition of sediments and smothering (construction and O&M); and
- Changes to physical processes (O&M).

²¹ <http://jncc.defra.gov.uk/protectedsites/sacselection/n2kforms/UK0030371.pdf>

²² <https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK0030371&SiteName=gate&countyCode=&responsiblePerson=&SeaArea=&IFCAArea>

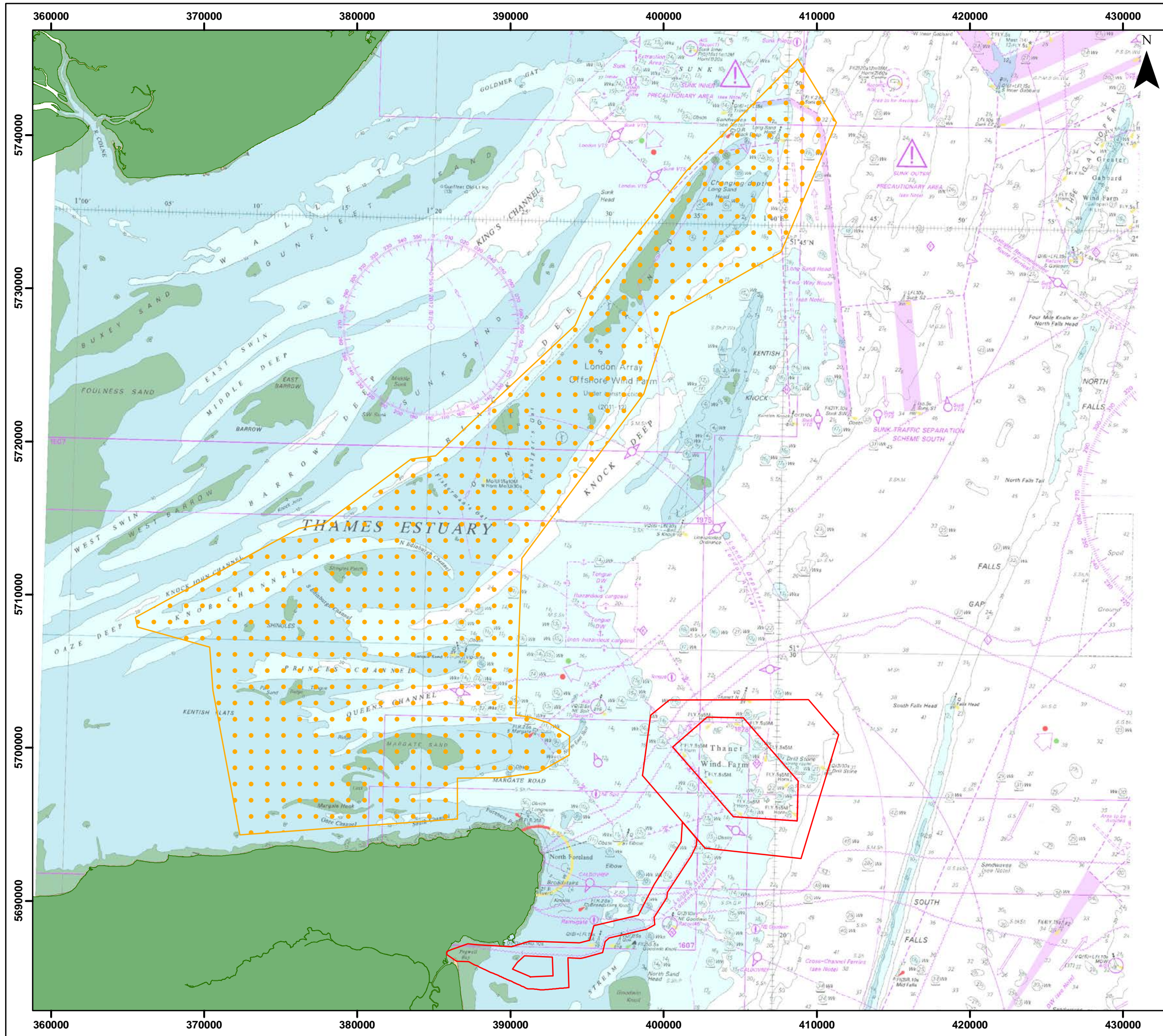
9.3.6 The Supplementary Advice sourced for the Margate and Long Sands SAC identified that the feature is currently considered to be in good condition and/ or currently unimpacted by anthropogenic activities²³. The Conservation Objectives for the site²⁴ as made in September 2017 are available as follows:

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 Favourable Conservation Status of its qualifying features, by maintaining or restoring:

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

²³<https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK0030371&SiteName=gate&SiteNameDisplay=Margate+and+Long+Sands+SCI&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=>

²⁴<https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK0030371&SiteName=gate&countyCode=&responsiblePerson=&unitId=&SeaArea=&IFCAArea=#SiteInfo>



THANET EXTENSION OFFSHORE WIND FARM

Figure 9.2
Margate and Long Sands SAC in Relation to Thanet Extension

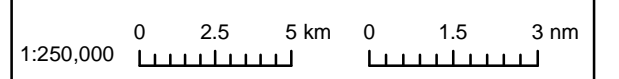
Legend

- Offshore Red Line Boundary
- Margate and Long Sands SAC

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.2_MargLongSandsSAC			Figure 9.2
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By	RM	Layout	N/A	

9.4 Thanet Coast and Sandwich Bay SPA

9.4.1 The citation for the Thanet Coast and Sandwich Bay SPA is dated 1992, with the site covering some 1,870.16 ha of marine and coastal habitat supporting breeding/ wintering seabirds/ waders in east Kent. The receptor group 'subtidal and intertidal benthic habitats' is relevant to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay SPA; receptor group 'onshore biodiversity' is relevant to the qualifying features European golden plover and ruddy turnstone. Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2);
- Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 5-2: Benthic Ecology – Subtidal Technical Report (Document Ref: 6.4.5.2);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8);
- Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5);
- Volume 5, Annex 5-4: Baseline Onshore and Intertidal Ornithology Report (Document Ref: 6.5.5.4);
- Volume 5, Annex 5-13: Intertidal Waterfowl Data Analysis in Relation to Onshore Works (Document Ref: 6.5.5.13);
- SPA Citation for Thanet Coast (Kent) (HTR/DAS 1992);
- Thanet Coast and Sandwich Bay SPA Standard Data form (JNCC, 2006);
- North East Kent European Marine Sites (comprising Thanet Coast cSAC, Thanet Coast and Sandwich Bay SPA and Sandwich Bay cSAC) Regulation 33(2) Advice (English Nature, 2000);
- North East Kent European marine sites Management Scheme 2007-2012²⁵;
- Thanet Coast & Sandwich Bay SPA Conservation Objectives (Natural England, 2014); and
- Site Improvement Plan (SIP): North East Kent (Thanet) (Natural England, 2014).

9.4.2 The site is designated for the following qualifying features:

- *Pluvialis apricaria*; European golden plover (Non-breeding);
- *Arenaria interpres*; Ruddy turnstone (Non-breeding); and
- *Sterna albifrons*; Little tern (Breeding).

9.4.3 Since the time of the original citation little tern has ceased to breed at the site and numbers of European golden plover have declined significantly. The SPA review (Stroud *et al.*, 2001), which included a comprehensive review of the UK's Special Protection Areas, therefore recommended the removal of little tern and European golden plover as qualifying features. However, the findings of the SPA review have yet to be formally ratified and until that time the legal list of qualifying species remains that given on the SPA citation. European golden plover and little tern are therefore both still considered as qualifying features in this report.

9.4.4 The original 1992 citation also notes that the SPA includes a wide variety of coastal habitats, including areas of chalk cliff, rocky shore, shingle, sand and mudflats, saltmarsh and sand dunes. As well as its value for breeding and wintering birds, the site supports outstanding communities of terrestrial and marine plant species, a significant number of rare invertebrate species, and is of considerable geological importance.

9.4.5 The 1992 citation details qualification of the SPA under Article 4.1 for supporting:

- A nationally important breeding population of little tern (30 pairs over 1% of the British population, and
- A nationally important wintering population of European golden plover (five year period 1985/86-1989/90 an average peak count of 1,980 golden plover representing 15% of the British wintering population).

9.4.6 The 1992 citation also details qualification of the SPA under Article 4.2 for regularly supporting an internationally important wintering population of ruddy turnstone, 1,340 individuals representing at least 3% of the British wintering population and 2% of the East Atlantic Flyway population (five year peak mean 1986/87 - 1990/91).

²⁵ <http://www.thanetcoast.org.uk/factfile/ne-kent-mpa-management-scheme/management-scheme-2007-to-2012/>

9.4.7 The relevant Regulation 33 advice noted that the important bird populations require a functional ecosystem, capable of supporting intertidal habitat for feeding and roosting. The most important factors related to this are:

- Current extent and distribution of suitable feeding and roosting habitat (e.g. intertidal mudflats);
- Sufficient prey availability (e.g. small fish, crustaceans and worms);
- Minimal levels of disturbance; and
- Water quality necessary to maintain intertidal plant and animal communities.

9.4.8 The Regulation 33 Advice also notes the following sub-features:

- Shingle shores - sparsely vegetated shingle areas are an important nesting area for little terns within the SPA;
- Shallow coastal waters - little tern feed in shallow coastal waters mainly on small fish (e.g. sandeel, pipefish, and gobies) and also crustacea (shrimps, prawns and crabs);
- Intertidal mud and sandflats - Mudflats and sandflats provide roosting grounds for European golden plover and provide feeding grounds for ruddy turnstones, as do the sandy beaches located in the bays between the outcropping chalk platform;
- Sand and shingle shores – ruddy turnstones can roost on coarse intertidal sediments as well as areas above the high tide mark;
- Chalk shores - the chalk foreshore provide important foraging areas for ruddy turnstones which forage on loose stones and seaweed for periwinkles and crustaceans.

9.4.9 Table 7.3 found potential for LSE, both during construction and O&M, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase. The potential for LSE can be summarised as follows:

- Habitat loss or disturbance to intertidal habitats used by qualifying species (construction, O&M and decommissioning);
- Temporary increases in SSCs, deposition of sediments and smothering and their effect on intertidal habitats used by qualifying species (construction, O&M and decommissioning);

- Noise and visual disturbance to qualifying species (construction, O&M and decommissioning);
- Change to physical processes and their effect on intertidal habitats used by qualifying species (O&M); and
- Possible displacement of recreational users of Pegwell Bay Country Park leading to disturbance of qualifying species elsewhere within the SPA (construction and decommissioning).

9.4.10 No Supplementary Advice has been sourced for the Thanet Coast and Sandwich Bay SPA, and as such no determination of the current conservation status of the designated features is available²⁶. However, the Conservation Objectives for the site²⁷ as updated in 2014, are available and are set out below. In addition, the SIP (Natural England, 2014) sets out the main issues that are currently impacting or threatening the condition of the features. These include: changes in species distributions (notably a decline in ruddy turnstone numbers and the loss of little tern as a breeding species); invasive species, notably Pacific oyster (*Crassostrea gigas*); recreational pressure; and water pollution.

Conservation Objectives

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.

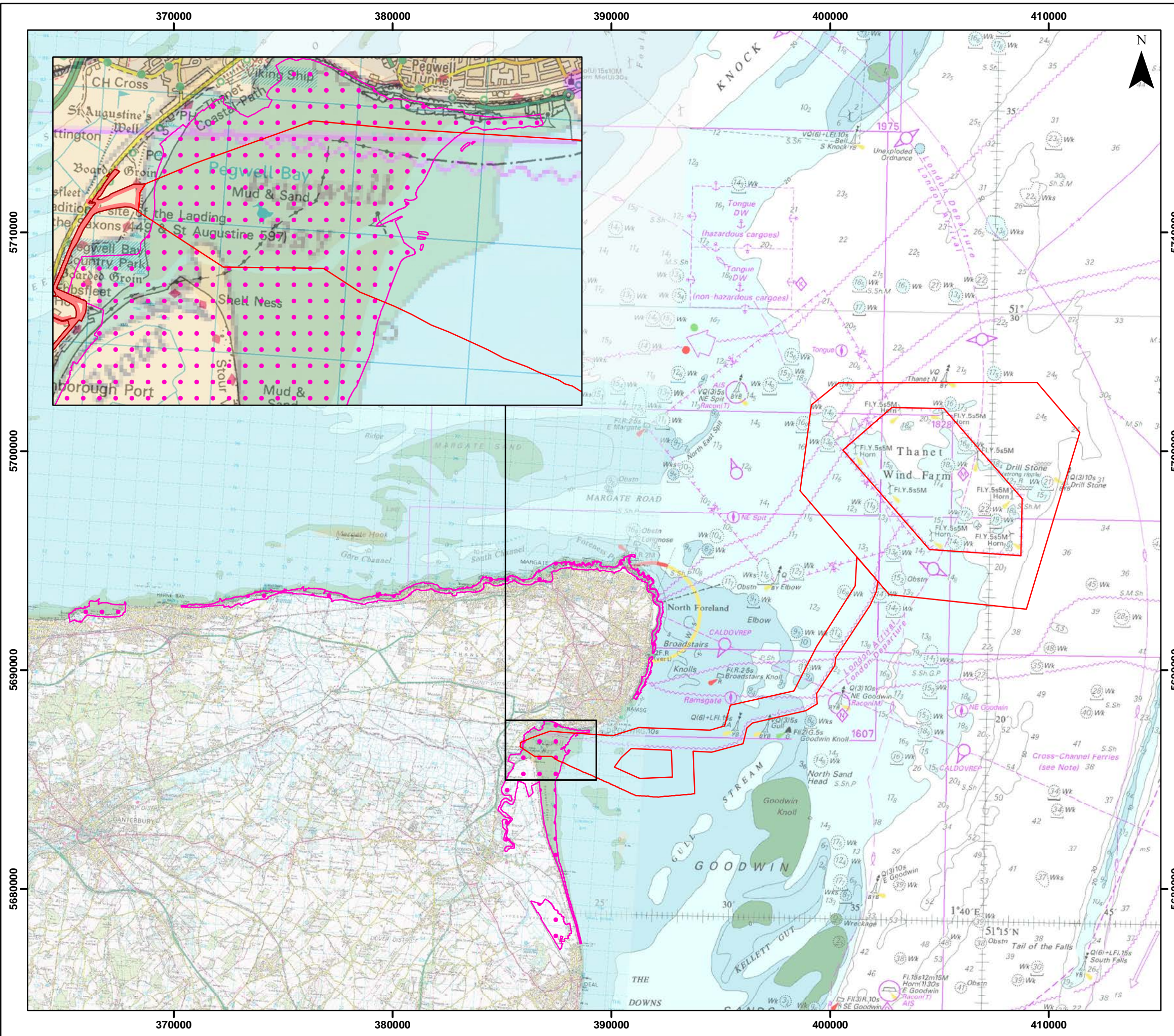
²⁶ <http://publications.naturalengland.org.uk/publication/6009926887407616>

²⁷ <http://publications.naturalengland.org.uk/file/4690519175200768>

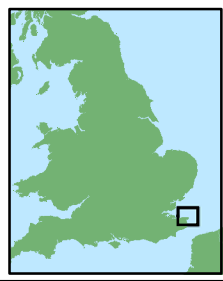
THANET EXTENSION OFFSHORE WIND FARM

Figure 9.3
Thanet Coast and Sandwich Bay SPA in Relation to
Thanet Extension

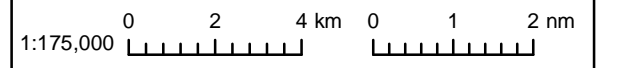
- Legend**
- Offshore Red Line Boundary
 - Thanet Coast and Sandwich Bay SPA



Datum: ETRS 1989
Projection: UTM31N



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9.5 Thanet Coast and Sandwich Bay Ramsar

9.5.1 The Information Sheet on Ramsar Wetlands (RIS) for the Thanet Coast and Sandwich Bay Ramsar is dated 1994, with the site covering some 2,169.23 ha of marine and coastal habitat. The receptor group 'subtidal and intertidal benthic habitats' is relevant to the intertidal habitats used by the designated ornithological features of the Thanet Coast and Sandwich Bay Ramsar; the receptor group 'onshore biodiversity' is relevant to all designated features. Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2);
- Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 5-2: Benthic Ecology – Subtidal Technical Report (Document Ref: 6.4.5.2);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8);
- Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5);
- Volume 5, Annex 5-4: Baseline Onshore and Intertidal Ornithology Report (Document Ref: 6.5.5.4);
- Volume 5, Annex 5-6: Terrestrial Invertebrate Assessment Report (Document Ref: 6.5.5.6);
- Volume 5, Annex 5-13: Intertidal Waterfowl Data Analysis in Relation to Onshore Works (Document Ref: 6.5.5.13);
- RIS for Thanet Coast and Sandwich Bay Ramsar;
- North East Kent European Marine Sites (comprising Thanet Coast cSAC, Thanet Coast and Sandwich Bay SPA and Sandwich Bay cSAC) Regulation 33(2) Advice (English Nature, 2000); and
- North East Kent European marine sites Management Scheme 2007-2012²⁸.

9.5.2 The site is designated for the following qualifying features:

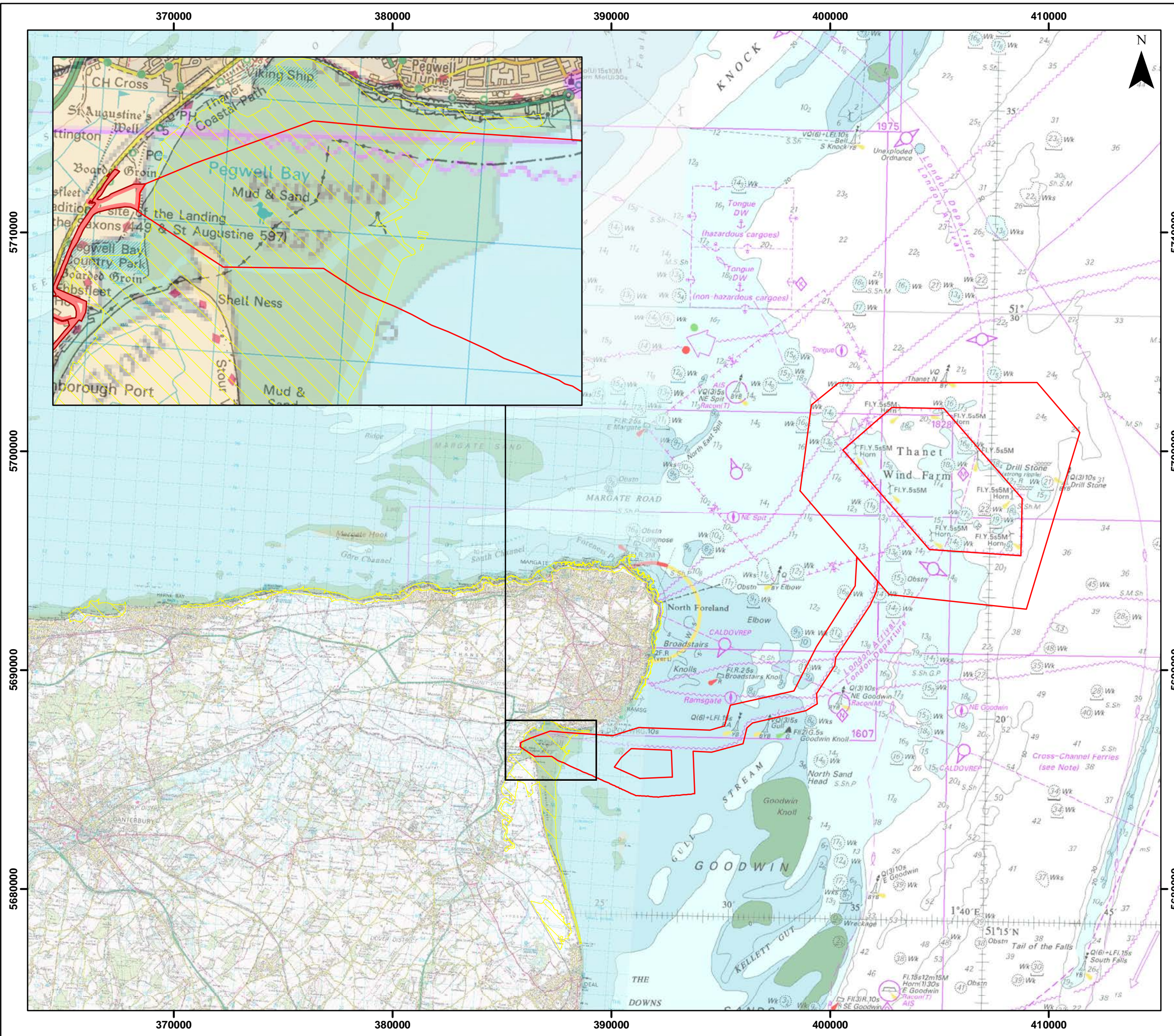
- Ramsar criterion 2: supports 15 British Red Data Book wetland invertebrates; and
 - Ramsar criterion 6 – species/ populations occurring at levels of international importance. Qualifying Species/ populations (as identified at designation): species with peak counts in winter: ruddy turnstone.
- 9.5.3 The RIS describes the site as consisting of a long stretch of rocky shore, adjoining areas of estuary, sand dune, maritime grassland, saltmarsh and grazing marsh.
- 9.5.4 Table 7.3 found potential for LSE, both during construction and O&M, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase. The potential for LSE can be summarised as follows:
- Habitat loss or disturbance to intertidal habitats used by qualifying bird species (construction, O&M and decommissioning);
 - Possible loss (permanent and/or temporary) of habitats supporting the three wetland invertebrate assemblage species *Didineis lunicornis*, *Ectemnius ruficornis* and *Eluma caelata* (construction, O&M and decommissioning);
 - Temporary increases in SSCs, deposition of sediments and smothering and their effect on intertidal habitats used by qualifying bird species (construction, O&M and decommissioning);
 - Noise and visual disturbance to qualifying bird species (construction, O&M and decommissioning);
 - Change to physical processes and their effect on intertidal habitats used by qualifying bird species (O&M); and
 - Possible displacement of recreational users of Pegwell Bay Country Park leading to disturbance of qualifying bird species elsewhere within the Ramsar site (construction and decommissioning).

²⁸ <http://www.thanetcoast.org.uk/factfile/ne-kent-mpa-management-scheme/management-scheme-2007-to-2012/>

THANET EXTENSION OFFSHORE WIND FARM

Figure 9.4
Thanet Coast and Sandwich Bay Ramsar in Relation to Thanet Extension

Legend
 Offshore Red Line Boundary
 Thanet Coast and Sandwich Bay SPA



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Projection: UTM31N

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9.6 Southern North Sea cSAC

9.6.1 JNCC and Natural Resources Wales (NRW) consulted on five possible sites for harbour porpoise in Welsh, Northern Irish, English and offshore waters in 2016, with these subsequently given Ministerial clearance and submitted to the EC for approval to designate on 30th January 2017. The relevant such site for Thanet Extension is the Southern North Sea candidate SAC (SNS cSAC). Located to the east of England, the site covers some 36,951 km² between the Straits of Dover in the south to the central North Sea (north of Dogger Bank). Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 5: Fish and Shellfish Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 6-1: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.1);
- Volume 4, Annex 6-2: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.2);
- Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8);
- JNCC, 2015. SAC Selection Assessment: Southern North Sea. January, 2016. Joint Nature Conservation Committee, UK.;
- JNCC, 2016 Harbour Porpoise Possible Area of Conservation Consultation;
- JNCC, 2016. Southern North Sea pSAC: Site Summary Leaflet. Joint Nature Conservation Committee, UK.;
- JNCC, 2016. Harbour Porpoise (*Phocoena phocoena*) possible Special Area of Conservation: Southern North Sea. Draft Conservation Objectives and Advice on Activities. Joint Nature Conservation Committee, UK.;
- JNCC, 2016. 2016 Consultation on possible Special Areas of Conservation for Harbour Porpoise. Post-Consultation Report. JNCC Report 597;
- JNCC, 2017a. A potential approach to assessing the significance of disturbance against conservation objectives of the harbour porpoise cSACs. Discussion document version 3.0; and

- JNCC, 2017b. Harbour porpoise SACs noise management stakeholder workshop. Report.

9.6.2 The site is designated under the Habitats Directive (92/43/EEC) for the Annex II species harbour porpoise only; there are no sub-features for the site. The receptor group 'marine mammals' is therefore relevant to the SNS cSAC.

9.6.3 Table 7.3 found potential for LSE during construction and O&M, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase. The potential for LSE can be summarised as follows:

- Increase in underwater noise (construction and decommissioning).

9.6.4 It is relevant to note that the SNS cSAC has areas identified for their importance during the summer and/ or winter periods – Thanet Extension array falls partially within an area noted for importance during the winter (1st October to 31st March inclusive), with the array boundary being at least 229 km distant from the area identified for importance during the summer (1st April to 30th September inclusive). The seasonal components of the cSAC are important considerations for HRA, as highlighted during discussions held with the SNCBs regarding the SNS cSAC (JNCC 2017a and 2017b). Specifically, the following:

'plans or projects occurring within the boundary of a SAC but operating outside of the season for which the SAC was designated, will not contribute to a 'significant portion'; instead such activities will be considered through the regular channels for EPS'

9.6.5 The North Sea Management Unit (MU) extends across approximately 678,540 km² of the North Sea (GIS files supplied by JNCC October 2015), including but not limited to UK waters, with the SNS cSAC covering 36,951 km² of the North Sea MU²⁹. The northerly two thirds of the SNS cSAC form the summer component (27,000 km² of the total cSAC), with the southerly part, together with a single discrete area to the north, forming the winter component (12,687 km² of the total cSAC) (Figure 9.5). Thanet Extension array area extends for some 73 km², some 30.7 km² of which overlaps with the SNS cSAC, representing approximately 0.08% of the total cSAC extent and approximately 0.005% of the North Sea MU.

²⁹ The area of the SNS cSAC has been sourced from the JNCC (<http://jncc.defra.gov.uk/page-7243>), with the extent of the seasons calculated based on the most recent JNCC shapefile (downloaded October 2017), converted into a ETRS89 UTM31N projection. This provides a slightly smaller overall area of the seasonal components of the cSAC compared to using the native projection of

the issued shapefiles. It is important for all calculations to be based on the same projection to avoid displacement issues, with the conversion being inherently more conservative. The SNS cSAC extents within GIS, as applied to the calculations made here, extends across 36,927 km².

9.6.6 As highlighted above, various documents have been produced and published by the JNCC in relation to the cSAC, collectively termed 'site identification documents', which have been produced in support of the identification and management of the site; these are available on the JNCC website together with the post consultation report and advice to government. Specific to the SNS cSAC, these include the Natura 2000 standard data form, the draft Conservation Objectives and Advice on Activities and the updated SAC selection document, with additional information pending. Additional documents were made available during workshops conducted in 2016 and 2017; these provide information on a proposed approach to assessing the significance of the impact of certain activities on the Conservation Objectives (JNCC 2017a and 2017b). Included within the documents provided by the JNCC was existing information on Management Units and the supporting literature for the social and economic impact of the cSACs.

9.6.7 For the purposes of this RIAA, the key points contained within the cSAC literature are considered to be as follows:

- The location and extent of the SNS cSAC is based on a combination of numerous data sets (including that collected from aerial, ship and land based platforms) and computer modelling;
- The level of uncertainty within the model results is variable (geographically and temporally), with uncertainty tending to be greatest in the winter;
- The SNS cSAC falls wholly within the North Sea MU (estimated abundance of 227,298 individuals across the entire North Sea MU);
- Harbour porpoise density appears to be influenced by oceanographic (e.g. stratification) and anthropogenic pressures (e.g. shipping density), with the most important anthropogenic pressure on harbour porpoise in north west European waters being commercial fisheries bycatch;
- Seasonal distribution tends to result in a higher density in the summer to the north of the SNS cSAC, with winter density tending to be greatest to the south. However, it should be noted that overall the distribution is not considered static, with seasonal and longer term shifts in distribution;
- Winter is defined as October to March inclusive, summer as April to September inclusive; and
- The temporal variability in distribution and abundance is considered extremely important, with significant implications for the way in which anthropogenic pressures are managed.

9.6.8 According to Annex III criterion (c), as a wide ranging species, harbour porpoise within SACs cannot be considered isolated in relation to the rest of the population and are therefore considered as part of the wider MU population. The SNS cSAC is estimated to support 17.5% of the proportion of the North Sea MU population that falls within UK waters, supporting approximately 18,500 individuals for at least part of the year, although seasonal differences and the use of a one month survey from a single year to derive that estimate lead the JNCC, in the site selection assessment document, to conclude that:

'it cannot be considered as a specific population number for the site... therefore not appropriate to use site population estimates in any assessments of effects of plans or projects (i.e. Habitat Regulations Assessments), as these need to take into consideration population estimates at the MU level, to account for daily and seasonal movements of animals'.

9.6.9 The draft Conservation Objectives for the SNS cSAC are presented below³⁰. The focus of the Conservation Objectives is on addressing pressures that may affect site integrity. The critical point as regards site integrity is not the extent or degree of impact resulting from a pressure, but the potential to affect (alone or in-combination) the ability of the SNS cSAC to meet the Conservation Objectives and maintain the existing FCS of the species.

To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.

To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long-term:

- The species is a viable component of the site.
- There is no significant disturbance of the species.
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

9.6.10 The focus of the above Conservation Objectives relates to the potential for the following:

- Killing or injuring a significant number of harbour porpoise (direct or indirect);
- Preventing their use of significant parts of the site (disturbance/ displacement);
- Significant damage to relevant habitats; or
- Significant reduction in prey base.

9.6.11 The meaning of the three conservation objectives is considered central to the subsequent determination of AEoI (the latter presented in section 11 alone and section 12 in-combination). How these are interpreted has been established by previous such assessments within the SNS cSAC, with a summary presented here.

The species is a viable component of the site

9.6.12 Harbour porpoise are considered to be a viable component of the site if they are able to survive and live successfully within it. The intent of this objective is to minimise the risk posed by activities within the site to the species viability, specifically activities that kill, injure or significantly disturb harbour porpoise.

9.6.13 The protection afforded harbour porpoise as an EPS, given its listing on Annex IV of the Habitats Directive, means that the species is protected from deliberate killing (or injury), capture and disturbance throughout its range. The definition of deliberate disturbance is given in 39(1)(b) of the Offshore Marine Conservation (Natural Habitats, etc.) Regulations 2007 Offshore Marine Regulations, (as amended). It is an offence under these regulations to deliberately disturb an EPS in such a way as to:

- Impair their ability to survive, to breed or reproduce, or to rear or nurture their young; or;
- To affect significantly the local distribution or abundance of that species.

No significant disturbance of the species within the site

9.6.14 The second Conservation Objective refers to disturbance of harbour porpoise. The cSAC literature identifies disturbance as generally, but not exclusively, deriving from activities that cause underwater noise. Existing JNCC guidelines are referenced with regard to minimising the risk of physical injury from various sources of loud underwater noise. Disturbance in the context of this SNS cSAC RIAA is considered to be a behavioural response to noise, which may lead some harbour porpoise individuals to exhibit displacement behaviour (noting that the level of response exhibited in response to noise is likely to vary greatly between individuals).

³⁰<http://jncc.defra.gov.uk/pdf/SouthernNorthSeaConservationObjectivesAndAdviceOnActivities.pdf>

9.6.15 In the context of a designated site, the worst effect of disturbance is the effective loss of available habitat. The presence of persistently high harbour porpoise densities in the SNS cSAC is attributed to an assumed availability of good feeding opportunities. The Conservation Objective therefore brings a requirement that any disturbance across the site is managed, to ensure that any disturbance will not lead to harbour porpoise being excluded from a significant portion of the site for a significant period of time. In particular, the following point made at the close of the Conservation Objective information is noted:

'This Conservation Objective aims to ensure that the site contributes, as best it can, to maintaining the Favourable Conservation Status of the wider harbour porpoise population. As such, how the impacts within the site translate into effects on the North Sea Management Unit population are of greatest concern'

9.6.16 Discussion on what would constitute significance in terms of disturbance has been ongoing since the sites were put forward as pSACs in early 2016, with these advocating a 'space and time' approach. Essentially, the aim is to enable sufficient availability of habitat for sufficient time, to ensure that disturbance does not lead to the exclusion of harbour porpoise from a significant proportion of the SAC for a period of time. How that significance has been defined is discussed in the determination of AEoI alone (section 11.3).

The Supporting Habitats and Processes relevant to Harbour Porpoise and their Prey are Maintained

9.6.17 The availability of sufficient suitable prey is particularly important for harbour porpoise. Although they have a wide variety of known prey species, the precise dietary composition of harbour porpoise specifically within the SNS cSAC is unknown.





9.6.18 Harbour porpoise prey habitat in the context of this SNS cSAC refers to the characteristics of the seabed and water column. It is noted that the modelling of harbour porpoise distribution undertaken as part of the SNS cSAC identification (Heinanen & Skov, 2015) found links between water depth and stratification during both summer and winter seasons, although the influence of these characteristics on harbour porpoise is unknown.

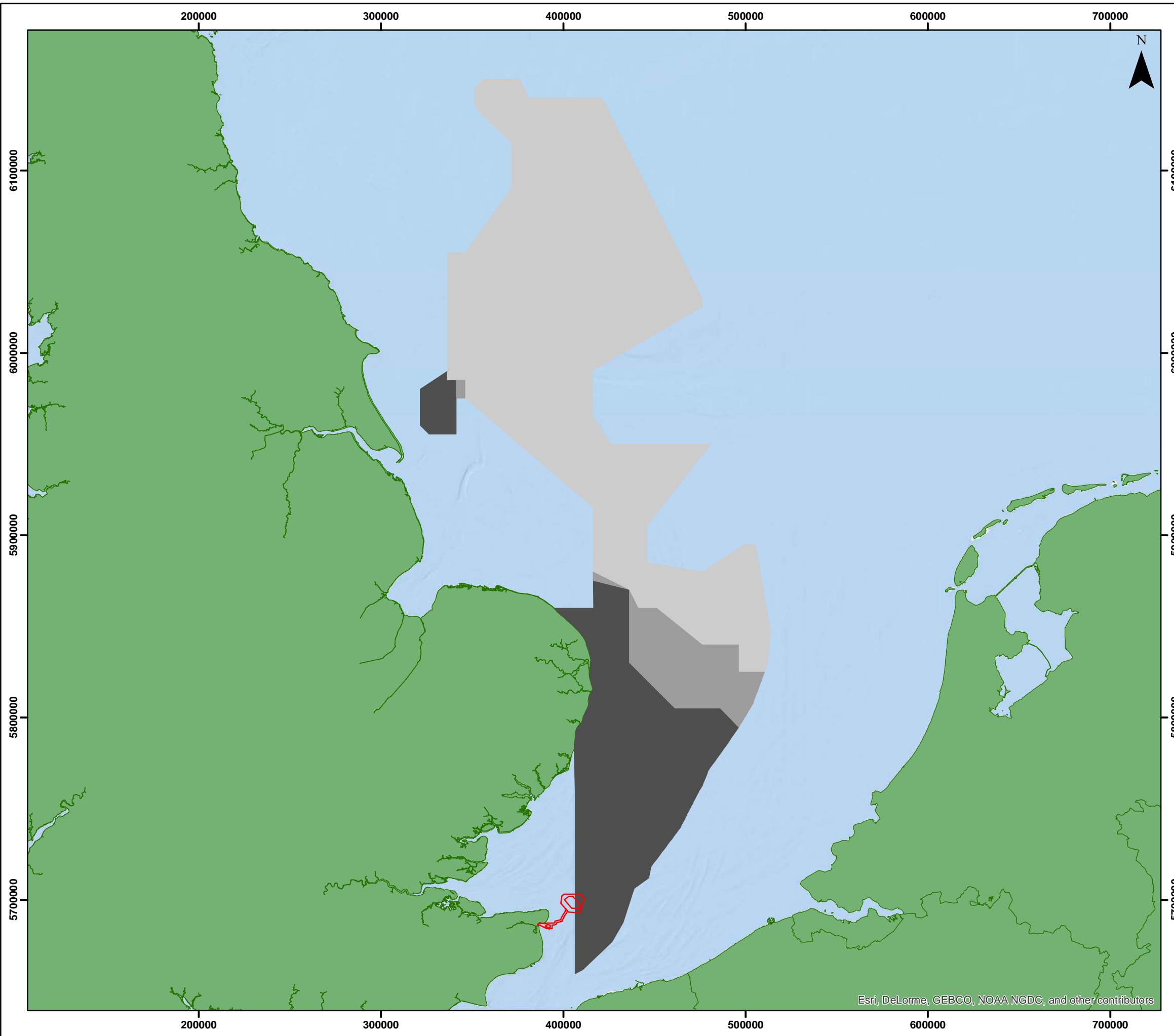
9.6.19 Volume 2, Chapter 6: Fish and Shellfish Ecology of the ES characterises the fish resource, with Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Refs: 6.2.6 and 6.2.2 respectively) of the ES describing relevant aspects of the seabed and water column as part of the baseline description of the receiving environment. This evidence base was drawn on to inform the assessments (as presented within the relevant ES chapters and the HRA) on the potential effects on these receptors from the proposed development. This SNS cSAC RIAA will draw on this existing evidence to inform consideration of potential effects on this Conservation Objective.

THANET EXTENSION OFFSHORE WIND FARM

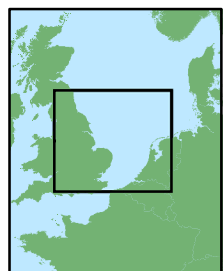
Figure 9.5
Southern North Sea cSAC
in Relation to Thanet
Extension

Legend

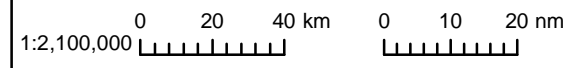
-  Offshore Red Line
-  SNS cSAC Summer and Winter Area
-  SNS cSAC Summer Area
-  SNS cSAC Winter Area



Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.5_SNScSAC		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.5**

9.7 Bancs de Flandres SCI

9.7.1 The Bancs de Flandres SCI (Bank of Flanders) was first proposed in 2010, with the site information sourced dated May 2017³¹. The site is located in French waters and extends for some 112,919 ha. Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 5: Fish and Shellfish Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 6-1: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.1);
- Volume 4, Annex 6-2: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.2);
- Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8); and
- Information available on the Inventaire National du Patrimoine Naturel³².

9.7.2 The site is wholly marine, being below low water, and designated for the following Annex I habitat and Annex II species:

- Sand banks which are slightly covered by sea water all the time;
- Harbour porpoise;
- Harbour seal; and
- Grey seal.

9.7.3 The information available indicates that the area is one of two French sites commonly frequented by harbour porpoise, especially for feeding.

9.7.4 The harbour seal and grey seal features associated with the site are covered separately below, with the receptor group 'marine mammals' being relevant to the potential effects identified. Screening did not identify potential LSE for the subtidal sand bank feature.

9.7.5 Table 7.3 found potential for LSE in relation to harbour porpoise during construction, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase. The potential for LSE can be summarised as follows:

- Increase in underwater noise (construction and decommissioning).

9.7.6 No draft Conservation Objectives have been sourced for the Bancs de Flandres SCI, with no management plan available and the information indicating that an objectives document is yet to be produced³³. Therefore, as a proxy and to ensure consistency across the RIAA, the conservation objectives for the SNS cSAC have been assumed to apply to the site as regards harbour porpoise and are presented below³⁴. The focus of the Conservation Objectives is on addressing pressures that may affect site integrity.

To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.

To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long-term:

- The species is a viable component of the site.
- There is no significant disturbance of the species.
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

³¹ <https://inpn.mnhn.fr/site/natura2000/FR3102002>

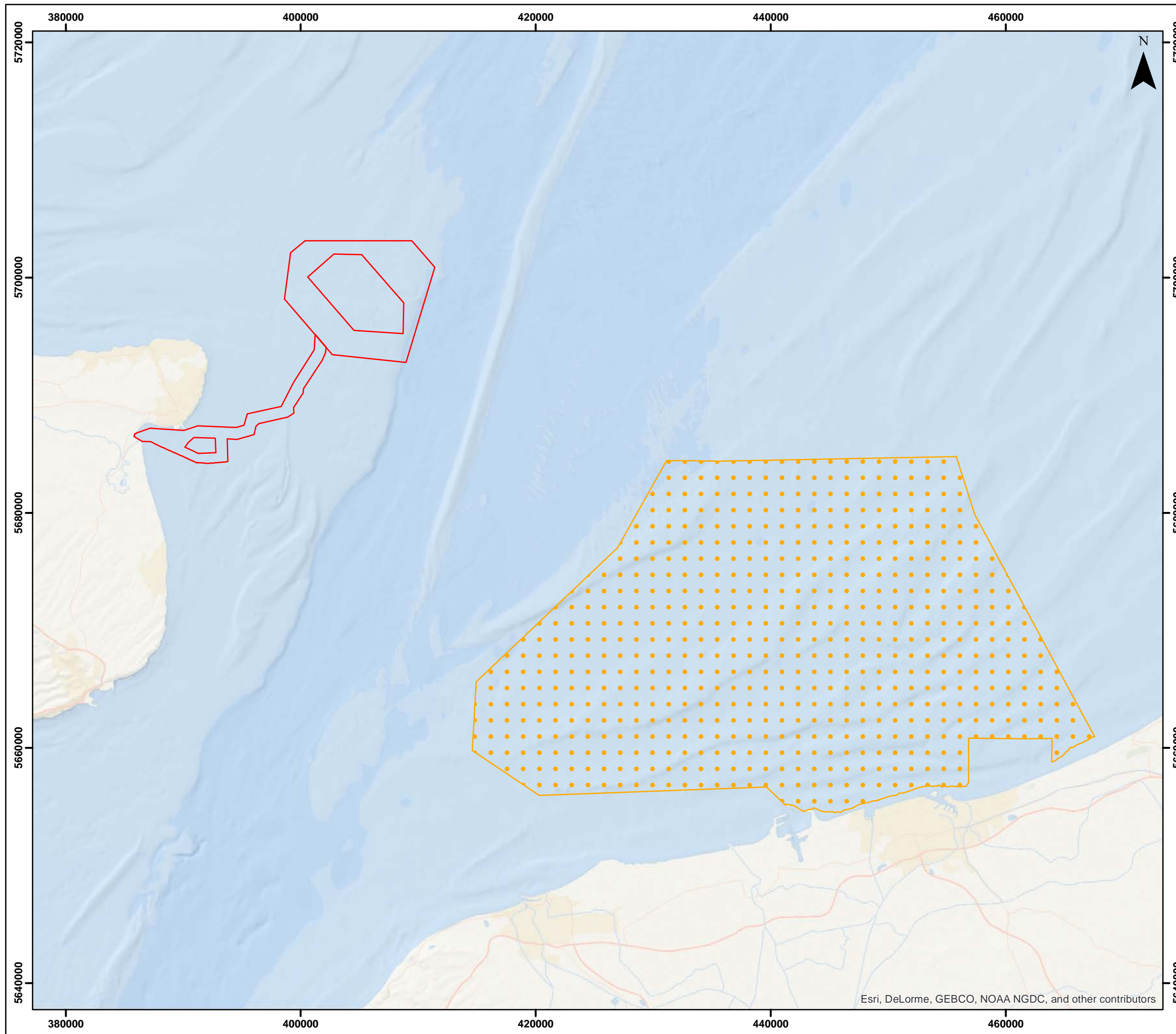
³² <https://inpn.mnhn.fr/site/natura2000/FR3102002>

³³ <https://inpn.mnhn.fr/site/natura2000/FR3102002/tab/gestion>

³⁴ <http://jncc.defra.gov.uk/pdf/SouthernNorthSeaConservationObjectivesAndAdviceOnActivities.pdf>

9.7.7 The focus of the above Conservation Objectives relates to the potential for the following:

- Killing or injuring a significant number of harbour porpoise (direct or indirect);
- Preventing their use of significant parts of the site (disturbance/ displacement);
- Significant damage to relevant habitats; or
- Significant reduction in prey base.

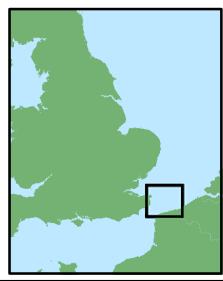


THANET EXTENSION OFFSHORE WIND FARM

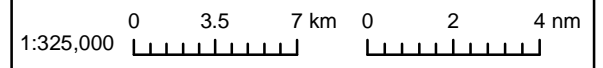
Figure 9.6
Bancs de Flandres SCI in
Relation to Thanet
Extension

- Legend**
- Offshore Red Line Boundary
 - Bancs de Flandres SCI

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.6_BancsdeFlandres		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.6**

9.8 Transboundary: Harbour Seal

- 9.8.1 The screening process identified eight transboundary sites of relevance for harbour seal, including the Bancs de Flandres SCI (Bank of Flanders) as included above for harbour porpoise. These sites are summarised in Table 9.1, including all habitats and species for which the sites have been designated (although it should be noted that only harbour seal is relevant in this table, with harbour porpoise considered above and grey seal considered below, with no other features from these sites screened in for LSE).
- 9.8.2 The receptor group 'marine mammals' is relevant to the harbour seal feature screened in from these sites. Key literature sources, including relevant project literature, are as follows:
- Volume 2, Chapter 5: Fish and Shellfish Ecology (Document Ref: 6.2.5);
 - Volume 4, Annex 6-1: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.1);
 - Volume 4, Annex 6-2: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.2);
 - Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7);
 - Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8); and
 - Relevant websites identified in Table 9.1.
- 9.8.3 Table 7.3 found potential for LSE during construction and decommissioning only, specifically in relation to the increase in underwater noise, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase.
- 9.8.4 No draft Conservation Objectives or other site literature have been sourced in English for the above sites. The JNCC identify the European status and distribution of the species³⁵, finding a near circumpolar distribution, with one of the four sub species (*P. vitulina vitulina*) occurring in Europe across a range stretching from Iceland and northern Norway south to northern France. The UK population of between 48,000 - 56,000 represents about 5% of the world population and approximately 50% of the EU population, the latter having shown a marked recovery after the viral epidemic of the late 1980s.

- 9.8.5 Therefore, as a proxy and to ensure consistency across the RIAA, the conservation objectives applied here for harbour seal are taken from the definition of favourable conservation status in Article 1 (JNCC, 2009), as below.

The conservation status will be taken as 'favourable' when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and;
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

³⁵ <http://jncc.defra.gov.uk/ProtectedSites/SACselection/species.asp?FeatureIntCode=S1365>

Table 9.1: Summary of Site Information for Sites screened in for the Annex II Species Harbour Seal only

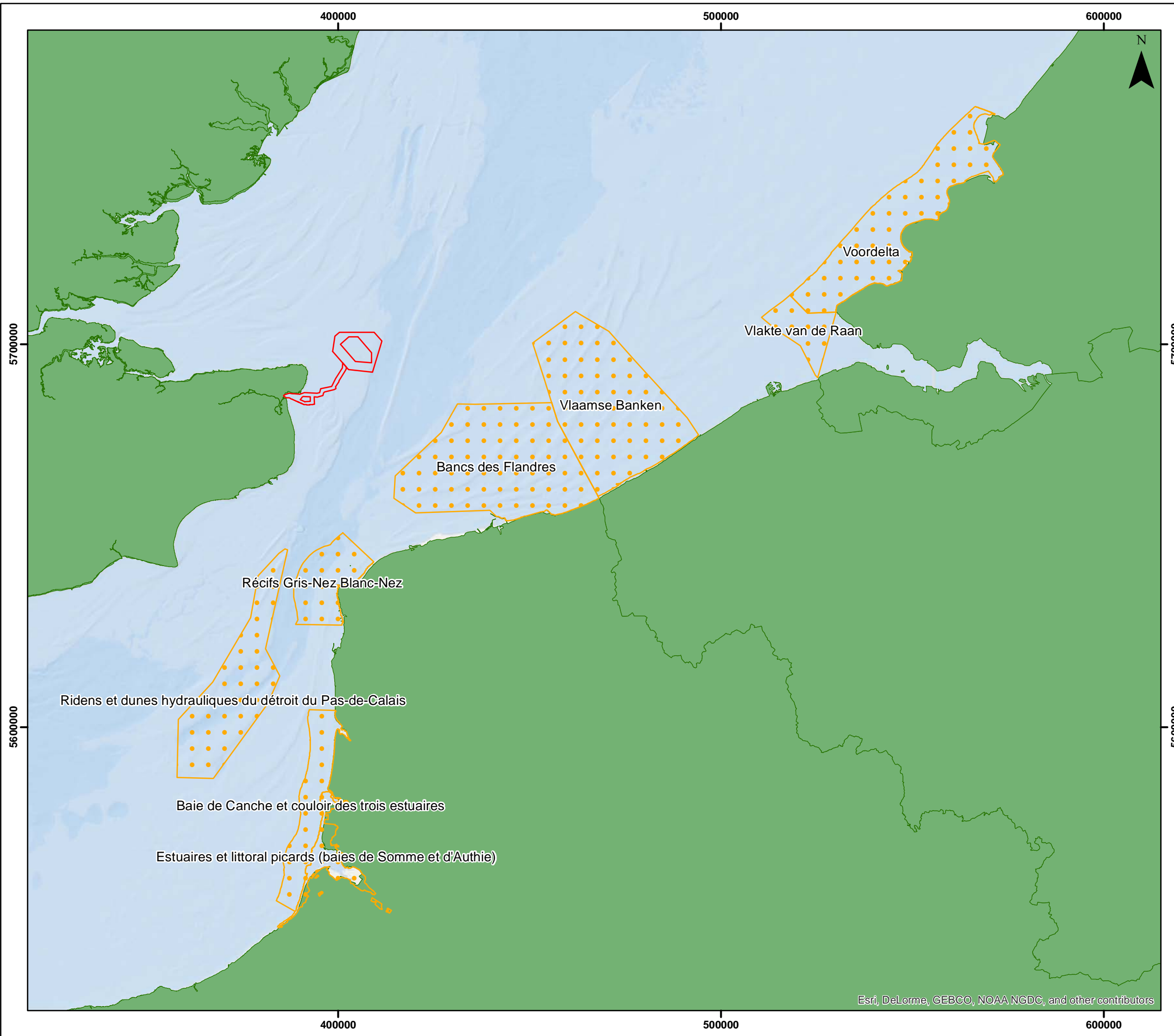
Site	Country	Area	Annex I Habitats	Annex II Species	Literature Source
Bancs de Flandres SCI	France	112,919ha	Sand banks which are slightly covered by sea water all the time	Harbour porpoise, harbour seal and grey seal	https://inpn.mnhn.fr/site/natura2000/FR3102002
Baie de Canche et couloir des trois estuaires SCI	France	33,306ha	Sand banks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Annual vegetation of drift lines Salicornia and other annuals colonising mud and sand Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	Harbour porpoise, harbour seal and grey seal Sea lamprey River lamprey Allis shad Atlantic salmon	https://inpn.mnhn.fr/site/natura2000/FR3102005?lg=en
Vlakte van de Raan	Belgium	17,500ha	Sand banks which are slightly covered by sea water all the time	Harbour porpoise, harbour seal and grey seal River lamprey Sea lamprey Twait shad	http://www.rwsnatura2000.nl/Gebieden/VvdR_Vlakte+van+d+e+Raan/default.aspx
Voordelta	Holland	92,367ha	Sand banks which are slightly covered by seawater all the time Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonizing mud and sand Spartina swards (Spartinion maritimae) Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Embryonic shifting dunes	Grey seal, Harbour seal Sea lamprey River lamprey Allis shad Twait shad	https://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=6&id=n2k113
Estuaires et littoral picards (baies de Somme et d'Authie)	France	15,662ha	Estuaries Coastal lagoons Annual vegetation of drift lines Perennial vegetation of stony banks Vegetated sea cliffs of the Atlantic and Baltic coasts Salicornia and other annuals colonising mud and sand Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Geoffroys bat Bottlenose dolphin Harbour porpoise Grey seal Harbour seal Great crested newt River lamprey Jersey tiger moth	https://inpn.mnhn.fr/site/natura2000/FR2200346

Site	Country	Area	Annex I Habitats	Annex II Species	Literature Source
			<p>Embryonic shifting dunes</p> <p>Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)</p> <p>Fixed coastal dunes with herbaceous vegetation (grey dunes)</p> <p>Dunes with <i>Hippophae rhamnoides</i></p> <p>Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenaria</i>)</p> <p>Wooded dunes of the Atlantic, Continental and Boreal region</p> <p>Sand banks which are slightly covered by sea water all the time</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)</p> <p>Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation</p> <p>Molinia meadows on calcareous, peaty or clayey-siltladen soils (<i>Molinion caeruleae</i>)</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels</p> <p>Alkaline fens</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>)</p> <p>Mudflats and sandflats not covered by seawater at low tide</p> <p>Reefs</p>	<p>Creeping marshwort</p> <p>Fen orchid</p>	
Recifs Gris-Nez Blanc-Nez	France	29,156ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, Grey seal, Harbour seal	https://inpn.mnhn.fr/site/natura2000/FR3102003
Vlaamse Banken	Belgium	109,940ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, grey seal, Harbour seal Twait shad, River lamprey, Sea lamprey	http://natura2000.eea.europa.eu/natura2000/SDF.aspx?site=BEMNZ0001
Ridens et dunes hydrauliques	France	69,245ha	<p>Sand banks which are slightly covered by seawater all the time</p> <p>Reefs</p>	Harbour porpoise Grey seal Harbour seal	https://inpn.mnhn.fr/site/natura2000/FR3102004

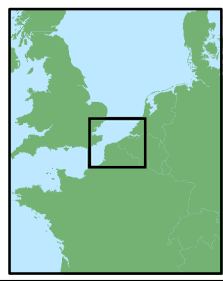
THANET EXTENSION OFFSHORE WIND FARM

Figure 9.7
Transboundary Harbour Seal Sites in Relation to Thanet Extension

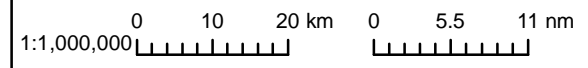
- Legend**
- Offshore Red Line Boundary
 - Transboundary Sites Identified for Harbour Seal



Datum: WGS 1984
Projection: UTM31N



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Drg No	Fig9.7_HarbourSeal		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

Figure 9.7

9.9 Transboundary: Grey Seal

9.9.1 The screening process identified eleven transboundary sites of relevance for grey seal, including the Bancs de Flandres SCI (Bank of Flanders) as included above for harbour porpoise and all sites screened in above for harbour seal. These sites are summarised in Table 9.2 below, including all habitats and species for which the sites have been designated (although it should be noted that only grey seal is relevant in this table, with harbour porpoise and harbour seal considered above in sections 9.7 and 9.8 respectively, with no other features from these sites screened in).

9.9.2 The receptor group 'marine mammals' is relevant to the grey seal feature screened in from these sites. Key literature sources, including relevant project literature, are as follows:

- Volume 2, Chapter 5: Fish and Shellfish Ecology (Document Ref: 6.2.5);
- Volume 4, Annex 6-1: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.1);
- Volume 4, Annex 6-2: Fish and Shellfish Baseline – Spring (Document Ref: 6.4.6.2);
- Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7);
- Volume 2, Chapter 8: Offshore Designated Sites (Document Ref: 6.2.8); and
- Relevant websites identified in Table 9.2 above.

9.9.3 Table 7.3 found potential for LSE during construction and decommissioning only, specifically in relation to the increase in underwater noise, with the potential for LSE during decommissioning found to be similar to and potentially less than those outlined in the construction phase.

9.9.4 No draft Conservation Objectives or other site literature have been sourced in English for the above sites. The JNCC identify the European status and distribution of the species³⁶, finding that grey seals are among the rarest seals in the world. Globally, there are three stocks of grey seal, with the east Atlantic stock extending from Iceland and northern Norway southwards to northern France, with the majority breeding around Great Britain and Ireland.

9.9.5 Therefore, as a proxy and to ensure consistency across the RIAA, the conservation objectives applied here for grey seal are taken from the definition of favourable conservation status in Article 1 (JNCC, 2009), as below.

The conservation status will be taken as 'favourable' when:

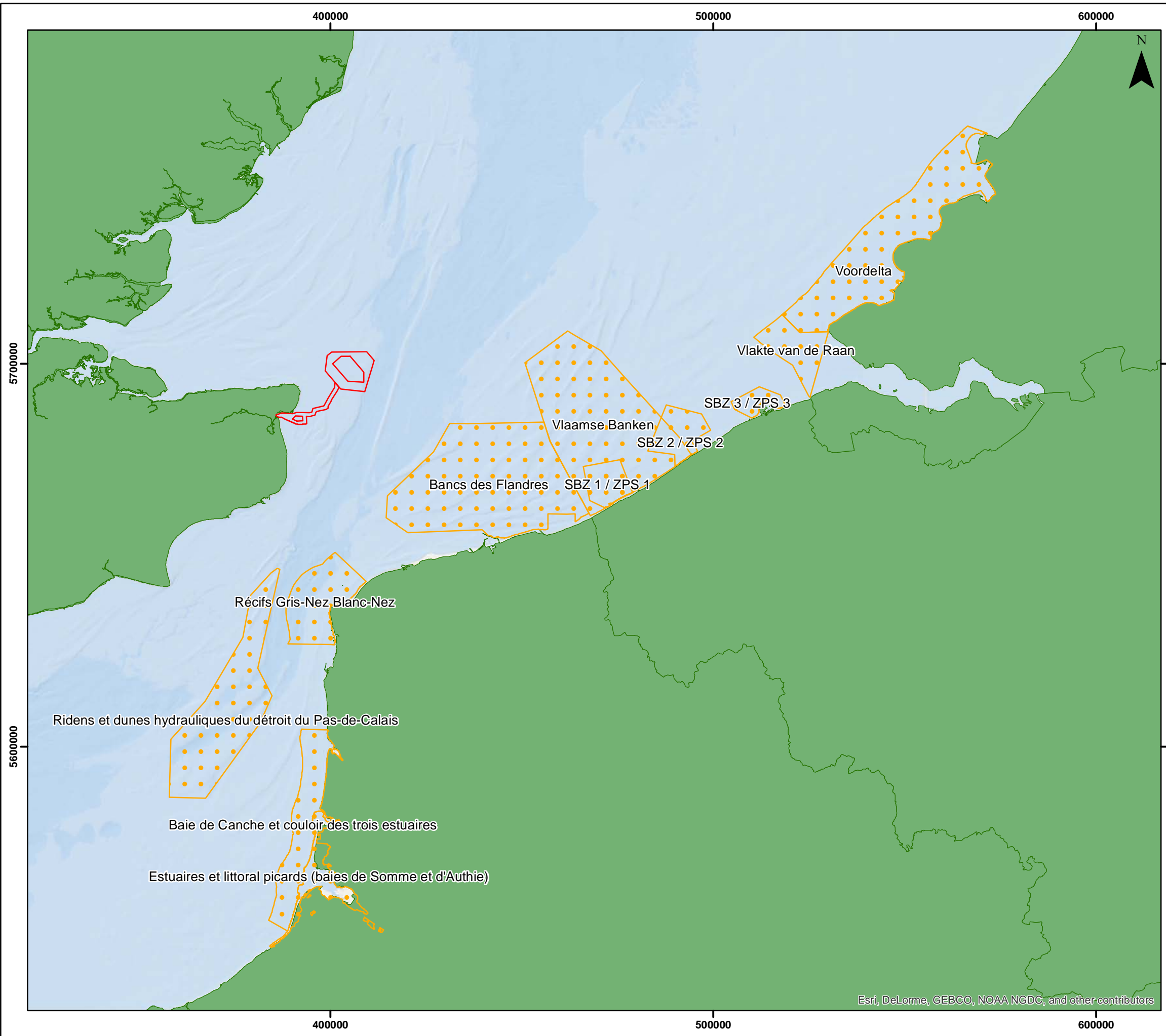
- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and;
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

³⁶ <http://jncc.defra.gov.uk/ProtectedSites/SACselection/species.asp?FeatureIntCode=s1364>

Table 9.2: Summary of Site Information for Sites screened in for the Annex II Species Grey Seal only

Site	Country	Area	Annex I Habitats	Annex II Species	Literature Source
Bancs des Flandres SCI	France	112,919 ha	Sand banks which are slightly covered by sea water all the time	Harbour porpoise, harbour seal and grey seal	https://inpn.mnhn.fr/site/natura2000/FR3102002
Baie de Canche et couloir des trois estuaires SCI	France	33,306 ha	Sand banks which are slightly covered by sea water all the time Estuaries Mudflats and sandflats not covered by seawater at low tide Annual vegetation of drift lines Salicornia and other annuals colonising mud and sand Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)	Harbour porpoise, harbour seal and grey seal Sea lamprey, River lamprey, Allis shad, Atlantic salmon	https://inpn.mnhn.fr/site/natura2000/FR3102005?lg=en
Vlakte van de Raan	Belgium	17,500 ha	Sand banks which are slightly covered by sea water all the time	Harbour porpoise, harbour seal and grey seal Sea lamprey, River lamprey, Twait shad	http://www.rwsnatura2000.nl/Gebieden/VvdR_Vlakte+van+de+Raan/default.aspx
Voordelta	Holland	92,367 ha	Sand banks which are slightly covered by seawater all the time Mudflats and sandflats not covered by seawater at low tide <i>Salicornia</i> and other annuals colonizing mud and sand <i>Spartina</i> swards (<i>Spartinion maritima</i>) Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) Embryonic shifting dunes	Grey seal , Harbour seal Sea lamprey, River lamprey Allis shad, Twait shad	https://www.synbiosys.alterra.nl/natura2000/gebiedendatabase.aspx?subj=n2k&groep=6&id=n2k113
Estuaires et littoral picards (baies de Somme et d'Authie)	France	15,662 ha	Estuaries Coastal lagoons Annual vegetation of drift lines Perennial vegetation of stony banks Vegetated sea cliffs of the Atlantic and Baltic coasts Salicornia and other annuals colonising mud and sand Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) Embryonic shifting dunes Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes)	Harbour porpoise, Grey seal , Harbour seal Geoffroys bat Bottlenose dolphin Great crested newt River lamprey Jersey tiger moth Creeping marshwort Fen orchid	https://inpn.mnhn.fr/site/natura2000/FR2200346

Site	Country	Area	Annex I Habitats	Annex II Species	Literature Source
			<p>Dunes with <i>Hippophae rhamnoides</i></p> <p>Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenaria</i>)</p> <p>Wooded dunes of the Atlantic, Continental and Boreal region</p> <p>Sand banks which are slightly covered by sea water all the time</p> <p>Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)</p> <p>Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation</p> <p>Molinia meadows on calcareous, peaty or clayey-siltladen soils (<i>Molinion caeruleae</i>)</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels</p> <p>Alkaline fens</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>)</p> <p>Mudflats and sandflats not covered by seawater at low tide</p> <p>Reefs</p>		
Recifs Gris-Nez Blanc-Nez	France	29,156 ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, Grey seal , Harbour seal	https://inpn.mnhn.fr/site/natura2000/FR3102003
Vlaamse Banken	Belgium	109,940 ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, Grey seal , Harbour seal Twait shad, Sea lamprey, River lamprey	http://natura2000.eea.europa.eu/natura2000/SDF.aspx?site=BEMNZ0001
SBZ 1	Belgium	6315.60 ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, Harbour seal, Grey seal Twait shad, Sea lamprey, River lamprey	http://eunis.eea.europa.eu/sites/BEMNZ0002
SBZ 2	Belgium	8139.70 ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, Harbour seal, Grey seal Twait shad, Sea lamprey, River lamprey	http://eunis.eea.europa.eu/sites/BEMNZ0003
SBZ 3	Belgium	5675.60 ha	<p>Reefs</p> <p>Sand banks which are slightly covered by sea water all the time</p>	Harbour porpoise, Harbour seal, Grey seal Twait shad, Sea lamprey, River lamprey	http://eunis.eea.europa.eu/sites/BEMNZ0004
Ridens et dunes hydrauliques	France	69,245 ha	<p>Sand banks which are slightly covered by seawater all the time</p> <p>Reefs</p>	Harbour porpoise Grey seal Harbour seal	https://inpn.mnhn.fr/site/natura2000/FR3102004

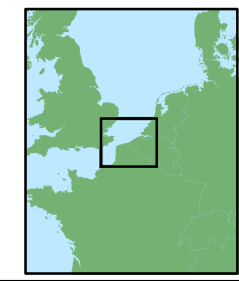


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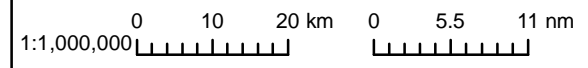
Figure 9.8
Transboundary Grey Seal Sites in Relation to Thanet Extension

- Legend**
- Offshore Red Line Boundary
 - Transboundary Sites identified for Grey Seal

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.8_GreySeal			Figure 9.8
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

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9.10 Outer Thames Estuary SPA

9.10.1 The Outer Thames Estuary SPA is a 392,451.66 km² area of marine and coastal habitat supporting wintering red throated diver off the coast of Kent, Essex, Suffolk and Norfolk and foraging areas for little tern and common tern during the breeding season. The site amalgamates the existing Outer Thames Estuary SPA with the Outer Thames Estuary Extension. The interest features of the site are described in the following documents:

- The Natural England Conservation Advice Package³⁷;
- Natura 2000 standard data form³⁸;
- The 'Departmental Brief' for the proposed extension (Natural England and JNCC, 2015);
- The consultation document published on the proposed extension³⁹; and
- The Site Improvement Plan for this SPA⁴⁰.

9.10.2 The interest features of this site are listed below along with the populations for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Red-throated diver; non-breeding; 6,466 individuals;
 - Screened in for potential disturbance and displacement at the construction stage alone;
 - Screened in for potential disturbance and displacement at the operational stage alone;
 - Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
 - Screened in for potential disturbance and displacement at the operational stage in-combination.
- Common tern; breeding; 266 pairs
 - Screened out for potential disturbance and displacement at the construction stage alone and in-combination;

- Screened out for potential disturbance and displacement at the operational stage alone and in-combination;
- Screened in for potential collision mortality at the operational stage alone; and
- Screened out for potential collision mortality at the operational stage in-combination.

- Little tern; breeding; 373 pairs
 - Screened out for potential disturbance and displacement at the construction stage alone and in-combination;
 - Screened out for potential disturbance and displacement at the operational stage alone and in-combination;
 - Screened in for potential collision mortality at the operational stage alone; and
 - Screened out for potential collision mortality at the operational stage in-combination.

9.10.3 The Conservation Objectives for the site are provided in Natural England (2016) as follows:

Conservation Objectives

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

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;

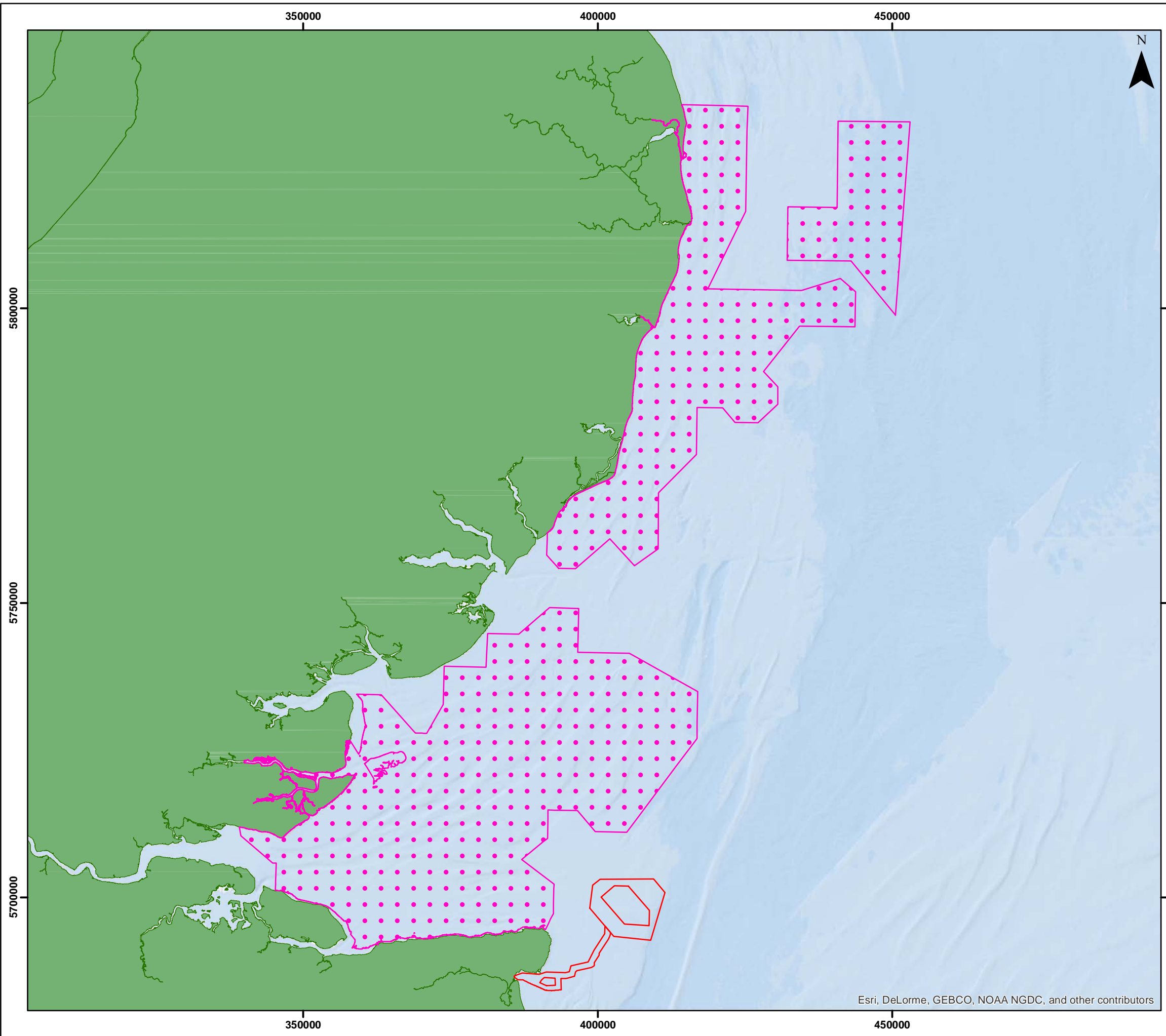
- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution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

³⁷ <http://publications.naturalengland.org.uk/publication/3233957>

³⁸ <http://jncc.defra.gov.uk/pdf/SPA/UK9020309.pdf>

³⁹ <http://publications.naturalengland.org.uk/publication/5078960463413248>

⁴⁰ <http://publications.naturalengland.org.uk/publication/4668757523824640>

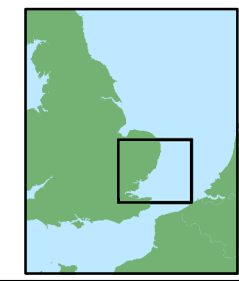


THANET EXTENSION OFFSHORE WIND FARM

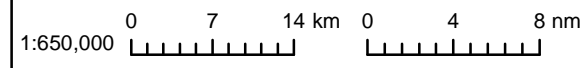
Figure 9.9
Outer Thames Estuary
SPA in Relation to
Thanet Extension

- Legend**
- Offshore Red Line Boundary
 - Outer Thames Estuary SPA

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.9_OutThamesSPA		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.9**

9.11 Foulness (Mid Essex Coast Phase 5) SPA

9.11.1 The Foulness (Mid Essex Coast Phase 5) SPA is a 10,941 ha area of intertidal habitat supporting breeding waders and seabirds; non-breeding waders, wildfowl and hen harrier; and a non-breeding waterbird assemblage in Essex. The interest features of the site are described in the following documents:

- Natural England supplementary advice⁴¹;
- Natura 2000 standard data form⁴²; and
- The Site Improvement Plan for the Essex Estuaries⁴³.

9.11.2 The interest features of this site are listed below along with the population for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Avocet; breeding; 26 pairs; non-breeding; 100 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Bar-tailed godwit; non-breeding; 7,639 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Common tern; breeding; 220 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Dark-bellied brent goose; non-breeding; 13,075 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Grey plover; non-breeding; 4,209 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Hen harrier; non-breeding; 1 - 19 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Knot; non-breeding; 40,429 individuals;

- Screened out for all types of potential effects alone and in-combination.
- Little tern; breeding; 24 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Oystercatcher; non-breeding; 11,756;
 - Screened out for all types of potential effects alone and in-combination.
- Redshank; non-breeding; 1,369 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Ringed plover; breeding; 1 - 135 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Sandwich tern; breeding; 320 pairs; and
 - Screened in for potential collision mortality at the operational stage alone; and
 - Screened out for potential collision mortality at the operational stage in-combination.
- Wintering waterbird assemblage with the following named species: Avocet, bar-tailed godwit, dark-bellied brent goose, dunlin, grey plover, oystercatcher and redshank.
 - Screened out for all types of potential effects alone and in-combination.

⁴¹ <https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK9009246>

⁴² <http://jncc.defra.gov.uk/pdf/SPA/UK9009246.pdf>

⁴³ <http://publications.naturalengland.org.uk/publication/5131941422563328>

9.11.3 The Conservation Objectives for the site were provided by Natural England in 2014⁴⁴ as follows:

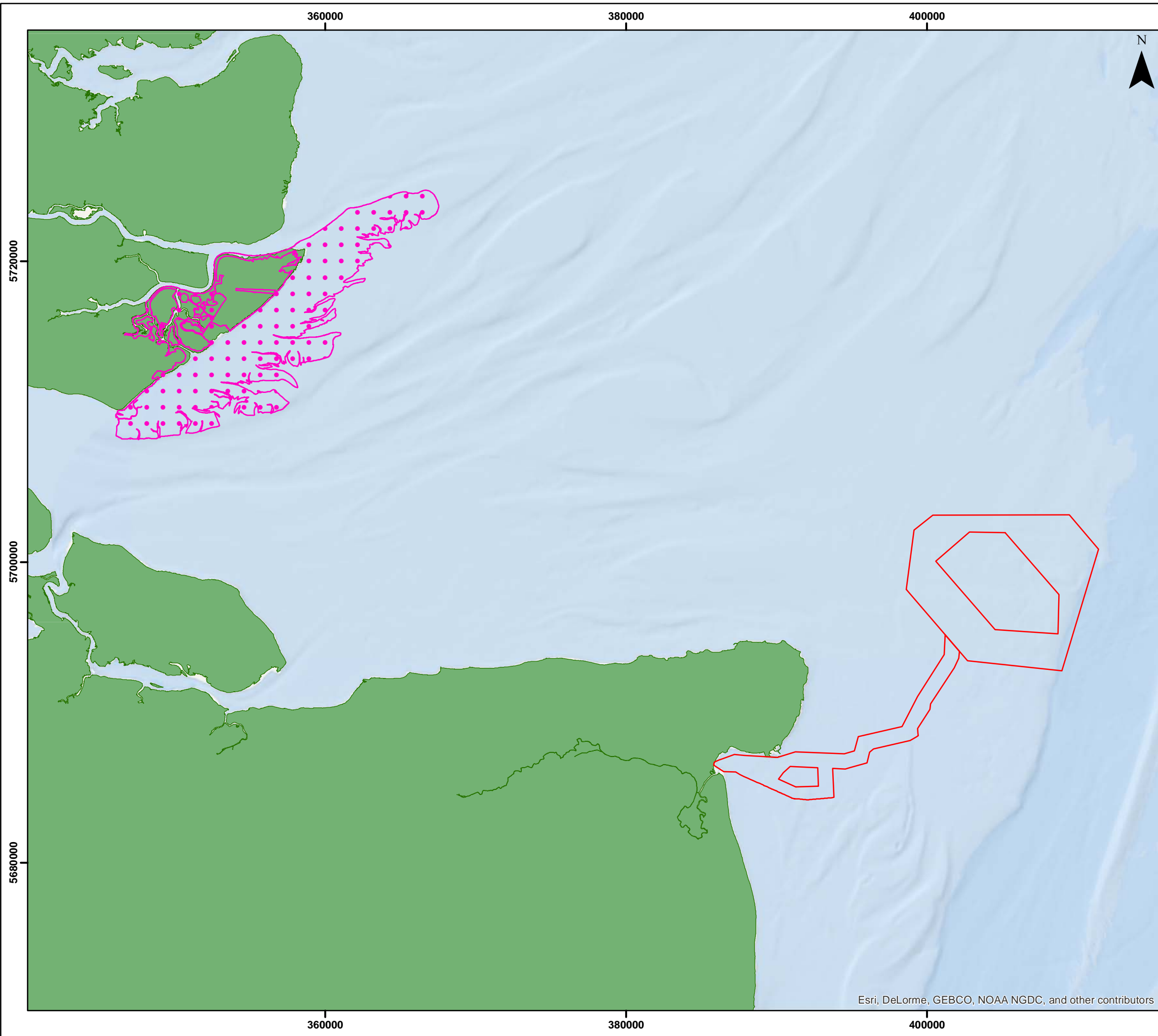
Conservation Objectives

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

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.

⁴⁴ <http://publications.naturalengland.org.uk/publication/5131941422563328>

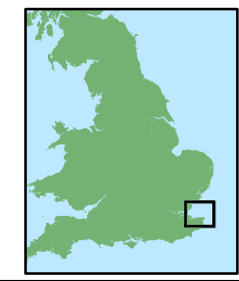


THANET EXTENSION OFFSHORE WIND FARM

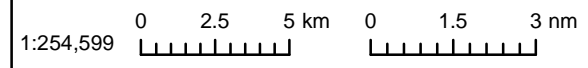
Figure 9.10
Foulness (Mid-Essex Coast Phase 5) SPA in Relation to Thanet Extension

- Legend**
- Offshore Red Line Boundary
 - Foulness (Mid-Essex Coast Phase 5) SPA

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.10_Foulness		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.10**

9.12 Alde-Ore Estuary SPA

9.12.1 The Alde-Ore Estuary SPA is a 2,404 ha area of coastal and intertidal habitat supporting breeding waders, seabirds and marsh harrier and wintering waders in Suffolk. The interest features of the site are described in the following documents:

- Natural England Conservation Advice for Marine Protected Areas: Alde-Ore Estuary SPA⁴⁵; and
- Natura 2000 standard data form⁴⁶.

9.12.2 The interest features of this site are listed below along with the population for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Avocet; breeding; 104 pairs; non-breeding; 766 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Lesser black-backed gull; breeding; 14,070 pairs;
 - Screened in for potential collision mortality at the operational stage alone and in-combination.
- Little tern; breeding; 48 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Marsh harrier; breeding; three pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Redshank; non-breeding; 1,919 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Ruff; non-breeding; three individuals; and
 - Screened out for all types of potential effects alone and in-combination.

- Sandwich tern; breeding; 170 pairs.
 - Screened out for all types of potential effects alone and in-combination.

9.12.3 The Conservation Objectives for the site were provided by Natural England in 2014⁴⁷ as follows:

Conservation Objectives

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

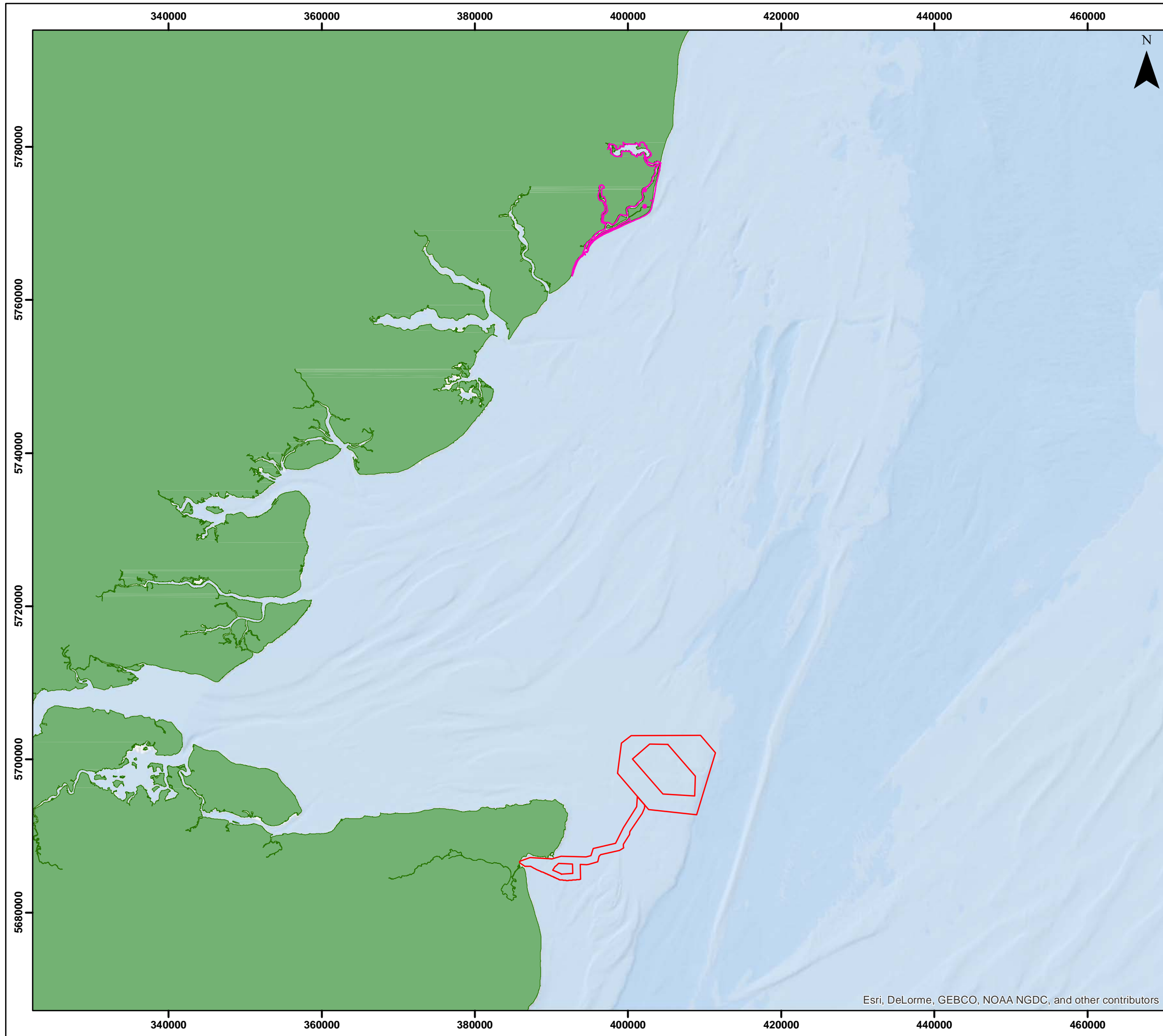
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- 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.

⁴⁵<https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9009112&SiteName=alde-ore&countyCode=&responsiblePerson=>

⁴⁶ <http://jncc.defra.gov.uk/pdf/SPA/UK9009112.pdf>

⁴⁷<http://publications.naturalengland.org.uk/publication/5170168510545920?category=6581547796791296>



**THANET EXTENSION
OFFSHORE WIND FARM**

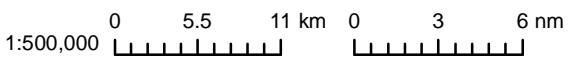
Figure 9.11
Alde-Ore Estuary SPA in
Relation to Thanet
Extension

- Legend**
- Offshore Red Line Boundary
 - Alde-Ore Estuary SPA

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.11_Alde-OreSPA		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.11**

9.13 Alde-Ore Estuary Ramsar

9.13.1 The Alde-Ore Estuary Ramsar is a 2,547 ha area of coastal and intertidal habitat supporting breeding seabirds and marsh harrier and non-breeding wildfowl and waders in Suffolk. The interest features of the site are described in the following documents:

- Natural England Conservation Advice for Marine Protected Areas: Alde-Ore Estuary Ramsar⁴⁸; and
- Ramsar Information Sheet⁴⁹.

9.13.2 The interest features of this site are listed below along with the population for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Avocet; non-breeding; 1,187 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Lesser black-backed gull; breeding; 5,790 apparently occupied nests;
 - Screened in for potential collision mortality at the operational stage alone and in-combination.
- Redshank; non-breeding; 2,368 individuals;
 - Screened out for all types of potential effects alone and in-combination.
- Breeding wetland bird assemblage; lesser black-backed gull, little tern, marsh harrier, Mediterranean gull and Sandwich tern; and
 - Screened out for all types of potential effects except for lesser black-backed gull already listed above.
- Wintering wetland bird assemblage; avocet, white-fronted goose, pintail, shelduck, shoveler, teal, redshank and wigeon.
 - Screened out for all types of potential effects alone and in-combination.

9.13.3 Conservation objectives are not published for Ramsar Sites. The Conservation Objectives for the SPA will be applied:

Conservation Objectives

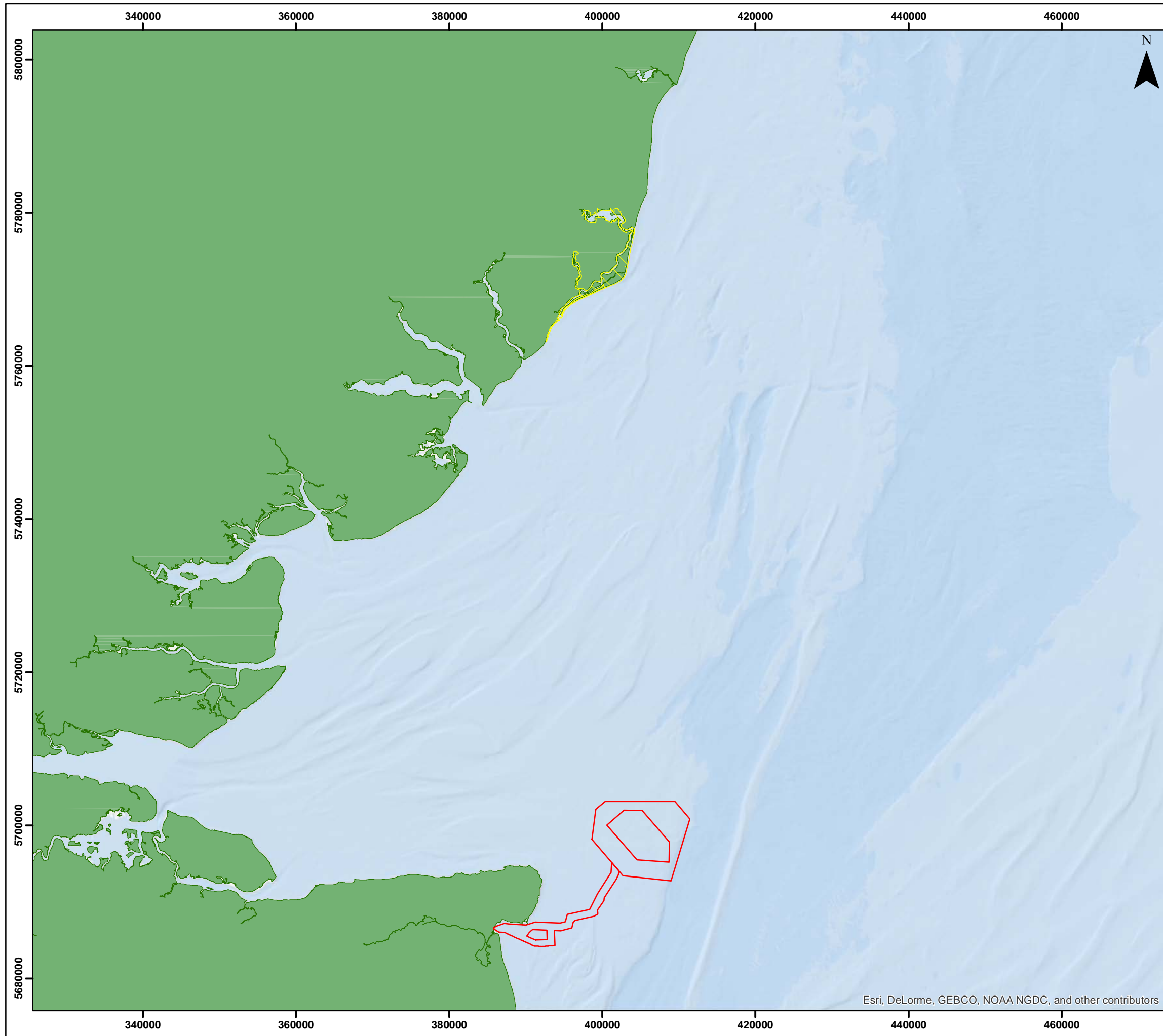
With regard to the SPA and the individual species and/ or assemblage of species for which the site has been classified (the 'Qualifying Features'), and subject to natural change;

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.



⁴⁸<https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK11002&SiteName=&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=>

⁴⁹<http://incc.defra.gov.uk/pdf/RIS/UK11002.pdf>

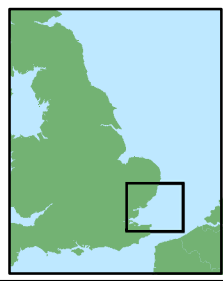


**THANET EXTENSION
OFFSHORE WIND FARM**

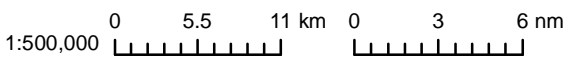
Figure 9.12
Alde-Ore Estuary Ramsar
in Relation to Thanet
Extension

- Legend**
-  Offshore Red Line Boundary
 -  Alde-Ore Ramsar

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.12_Alde-OreRAM		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.12**

9.14 Flamborough and Filey Coast pSPA

9.14.1 The Flamborough and Filey Coast pSPA is a 8,040 ha area of coastal and marine habitat supporting breeding seabirds in Yorkshire. The interest features of the site are described in the following documents:

- The ‘Departmental Brief’ for the proposed SPA (Natural England, 2014); and
- The information note published about the proposal (Natural England, 2012).

9.14.2 The interest features of this site are listed below along with the population for which the classification was made, and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Gannet; breeding; 8,469 pairs;
 - Screened in for potential collision mortality at the operational stage alone and in-combination.
- Guillemot; breeding; 41,607 pairs;
 - Screened in for potential disturbance and displacement at the construction stage alone;
 - Screened in for potential disturbance and displacement at the operational stage alone;
 - Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
 - Screened in for potential disturbance and displacement at the operational stage in-combination.
- Kittiwake; breeding; 44,520 pairs
 - Screened in for potential collision mortality at the operational stage alone and in-combination.
- Razorbill; breeding; 10,570 pairs
 - Screened in for potential disturbance and displacement at the construction stage alone;

- Screened in for potential disturbance and displacement at the operational stage alone;
- Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
- Screened in for potential disturbance and displacement at the operational stage in-combination.

- Breeding seabird assemblage; Fulmar, gannet, guillemot, kittiwake and razorbill
 - Only fulmar screened out for all types of potential effects, all other assemblage species as listed above.

9.14.3 The draft Conservation Objectives for the site were provided by Natural England in 2015⁵⁰ as follows:

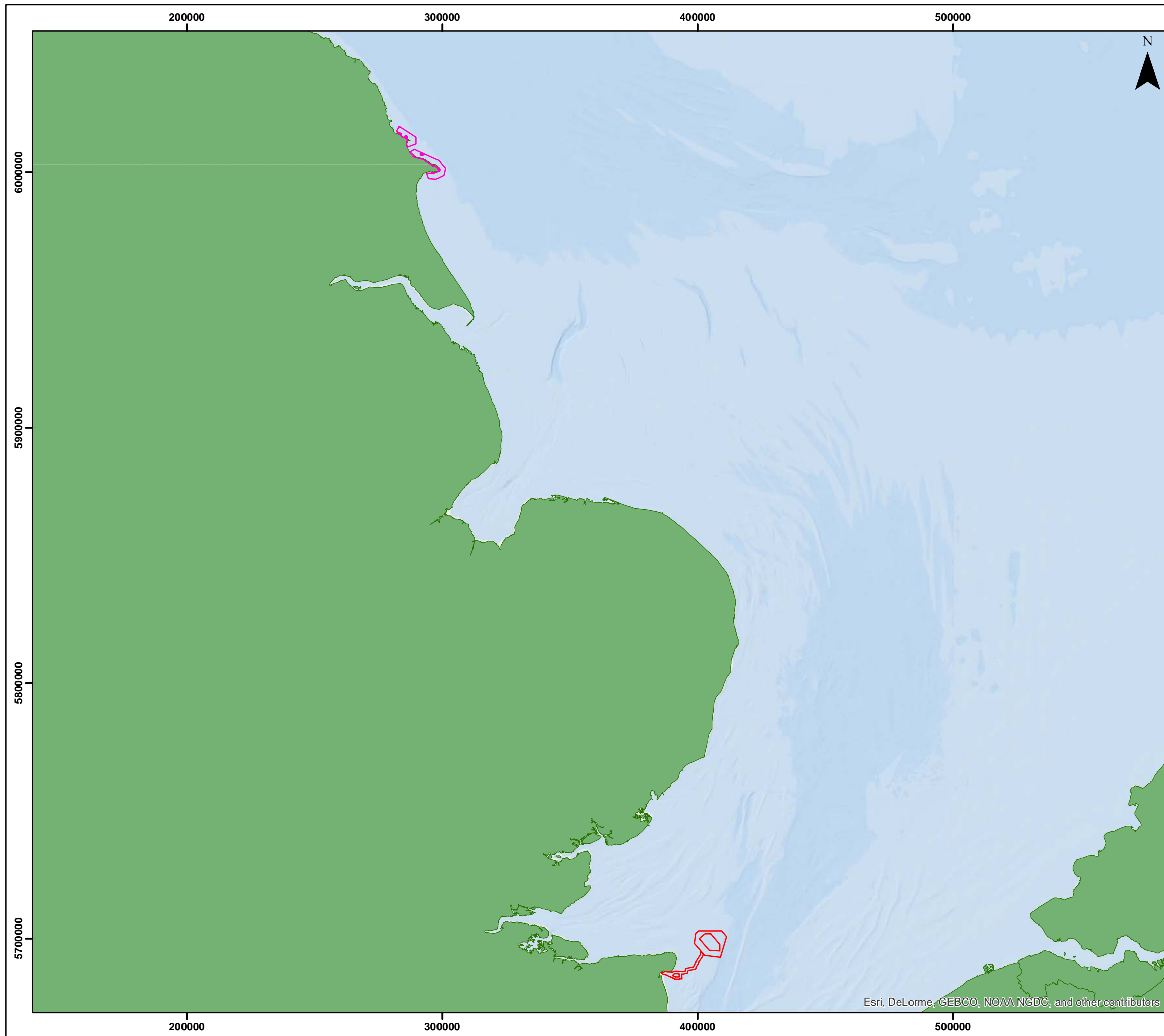
Conservation Objectives

With regard to the potential SPA and the individual species and/ or assemblage of species for which the site may be classified (the ‘Qualifying Features’), and subject to natural change;

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.

⁵⁰ <http://publications.naturalengland.org.uk/publication/5511099672690688>

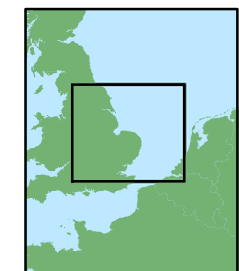


**THANET EXTENSION
OFFSHORE WIND FARM**

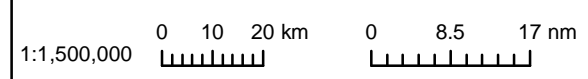
Figure 9.13
Flamborough and Filey
Coast pSPA in Relation
to Thanet Extension

- Legend**
-  Offshore Red Line Boundary
 -  Flamborough and Filey Coast pSPA

Datum: WGS 1984
Projection: UTM31N



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Drg No	Fig9.13_FlamFileypSPA		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.13**

9.15 Flamborough Head and Bempton Cliffs SPA

9.15.1 The Flamborough Head and Bempton Cliffs SPA is a 207 ha area of coastal habitat supporting breeding kittiwake in Yorkshire. The interest features of the site are described in the following documents:

- Natura 2000 standard data form⁵¹.

9.15.2 The interest features of this site are listed below along with the population for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Kittiwake; breeding; 83,370 pairs.
 - Screened in for potential collision mortality at the operational stage alone and in-combination.

9.15.3 The Conservation Objectives for the site were provided by Natural England in 2014⁵² as follows:

Conservation Objectives

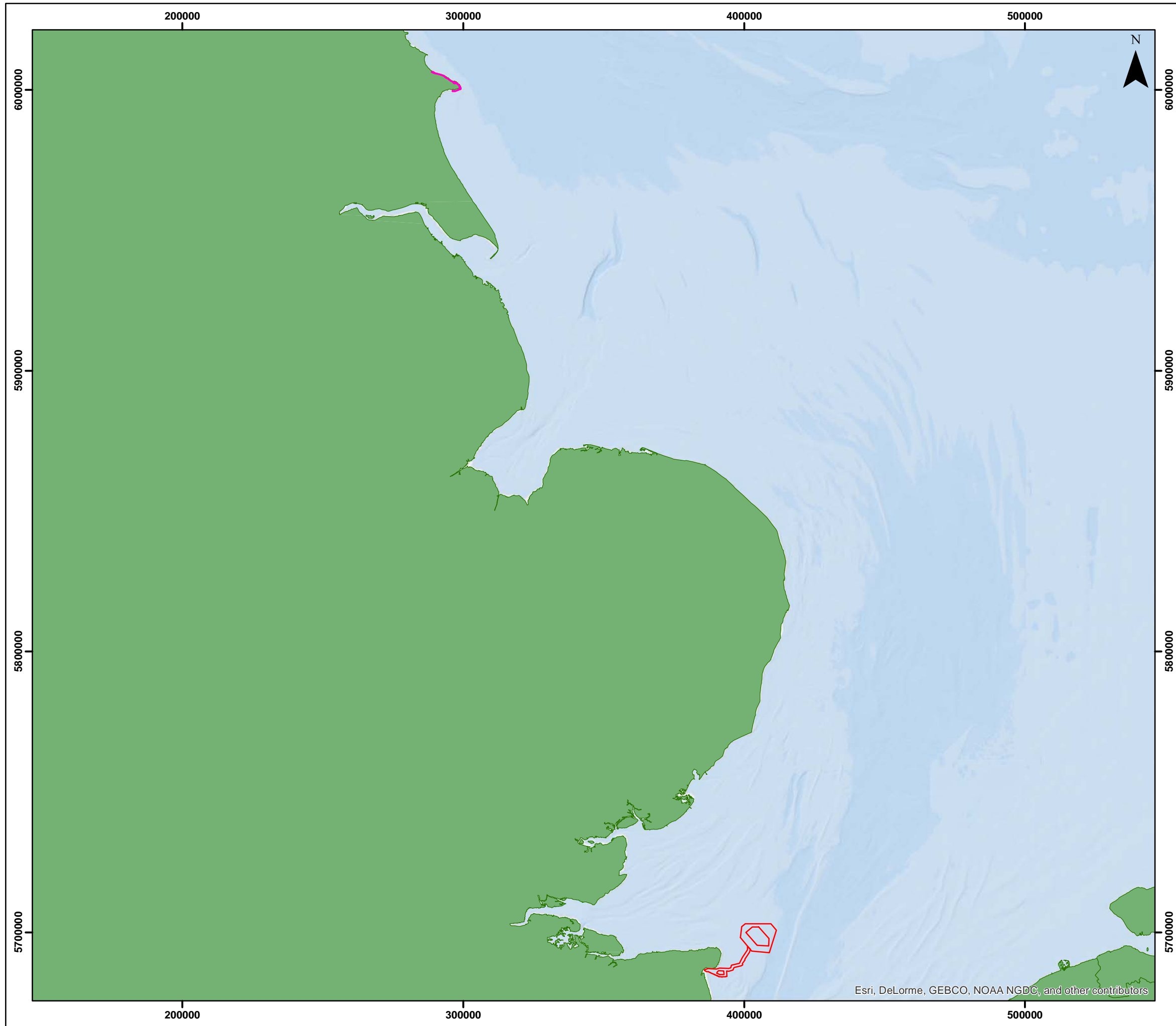
With regard to the SPA and the individual species and/ or assemblage of species for which the site has been classified (the 'Qualifying Features'), and subject to natural change;

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.



⁵¹ <http://jncc.defra.gov.uk/pdf/SPA/UK9006101.pdf>

⁵² <http://publications.naturalengland.org.uk/publication/5400434877399040>

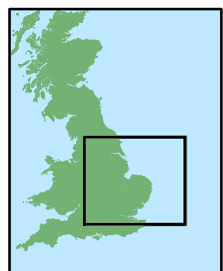


THANET EXTENSION OFFSHORE WIND FARM

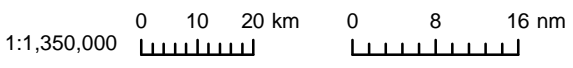
Figure 9.14
Flamborough Head and Bempton Cliffs SPA in Relation to Thanet Extension

- Legend**
-  Proposed Offshore Development Boundary
 -  Flamborough Head and Bempton Cliffs SPA

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.14_FlamBemptonCliffSPA			Figure 9.14
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

9.16 St. Abb's Head to Fast Castle SPA

9.16.1 The St. Abb's Head to Fast Castle SPA is a 1,737 ha area of coastal habitat supporting breeding seabirds in south east Scotland. The interest features of the site are described in the following documents:

- SNH (Scottish Natural Heritage) Sitelink Site Details for St. Abb's Head to Fast Castle SPA⁵³; and
- Natura 2000 standard data form⁵⁴.

9.16.2 The interest features of this site are listed below along with the population for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Guillemot; breeding; 31,300 pairs;
 - Screened in for potential disturbance and displacement at the construction stage alone;
 - Screened in for potential disturbance and displacement at the operational stage alone;
 - Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
 - Screened in for potential disturbance and displacement at the operational stage in-combination.
- Herring gull; breeding; 1,160 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Kittiwake; breeding; 21,170 pairs;
 - Screened in for potential collision mortality at the operational stage alone and in-combination.
- Razorbill; breeding; 2,180 pairs;

- Screened in for potential disturbance and displacement at the construction stage alone;
- Screened in for potential disturbance and displacement at the operational stage alone;
- Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
- Screened in for potential disturbance and displacement at the operational stage in-combination.

- Shag; breeding; 560 pairs; and
 - Screened out for all types of potential effects alone and in-combination.
- Breeding seabird assemblage; guillemot, herring gull, kittiwake, razorbill and shag.
 - Only herring gull and shag screened out for all types of potential effects, all other assemblage species as listed above.

9.16.3 The Conservation Objectives for the site are provided by SNH⁵⁵ as follows:

Conservation Objectives

To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long-term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

⁵³ https://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8579

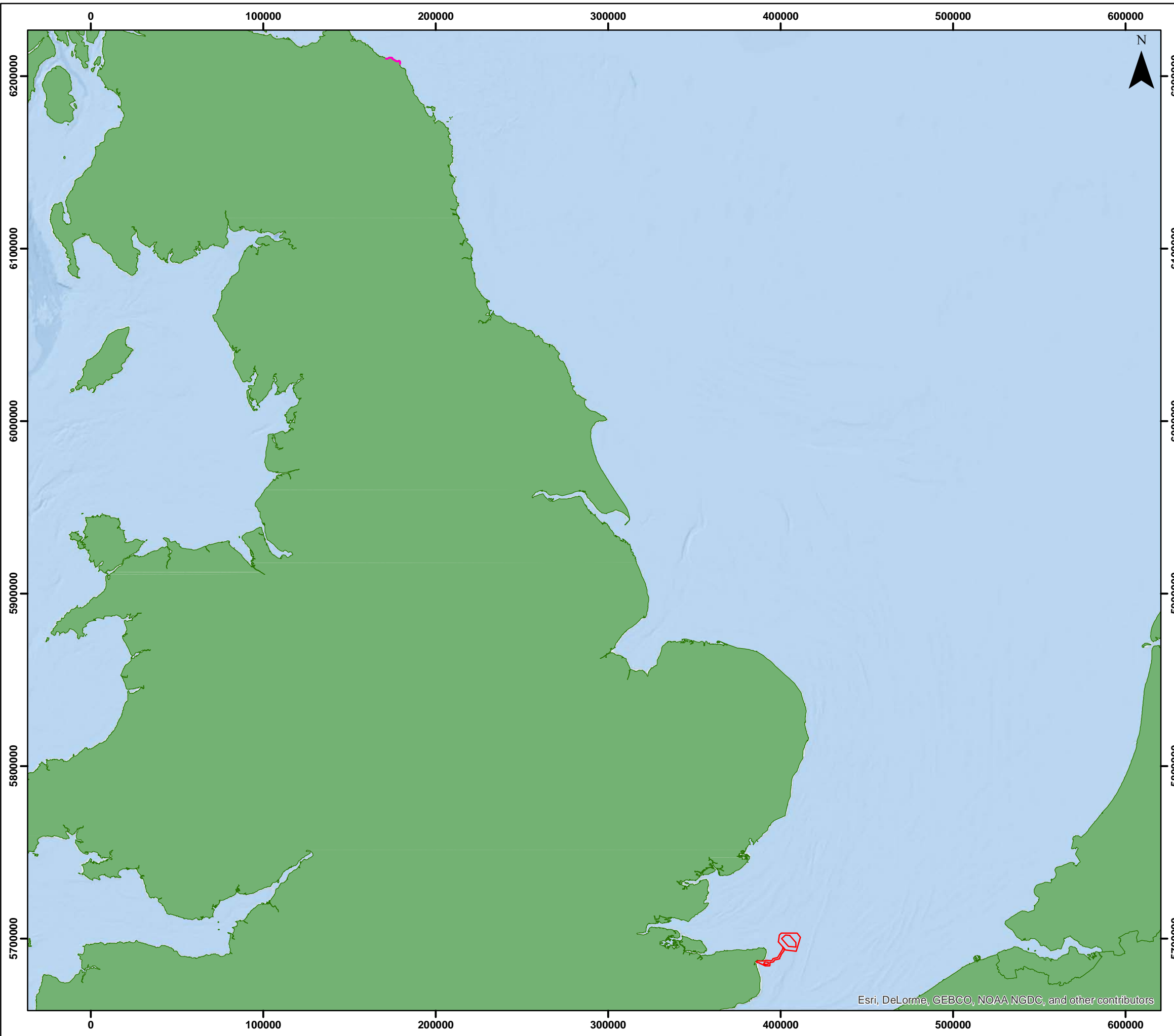
⁵⁴ <http://jncc.defra.gov.uk/pdf/SPA/UK9004271.pdf>

⁵⁵ https://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8579

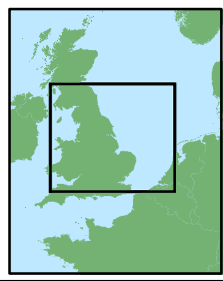
THANET EXTENSION OFFSHORE WIND FARM

Figure 9.15
St. Abb's Head to Fast
Castle SPA in Relation to
Thanet Extension

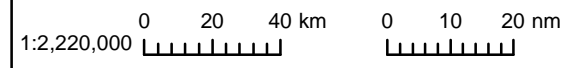
- Legend**
- Offshore Red Line Boundary
 - St Abb's Head to Fast Castle SPA



Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.15_StAbbFastCastle		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
9.15**

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

9.17 Northumberland Marine SPA

9.17.1 The Northumberland Marine SPA is a 88,498 ha area of marine habitat supporting breeding seabirds in Northumberland. The interest features of the site are described in the following documents:

- Natural England Conservation Advice for Marine Protected Areas: Northumberland Marine SPA⁵⁶; and
- Natura 2000 standard data form⁵⁷.

9.17.2 The interest features of this site are listed below along with the population for which the classification was made and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Arctic tern; breeding; 4,782 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Common tern; breeding; 1,286 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Guillemot; breeding; 32,876 pairs;
 - Screened in for potential disturbance and displacement at the construction stage alone;
 - Screened in for potential disturbance and displacement at the operational stage alone;
 - Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
 - Screened in for potential disturbance and displacement at the operational stage in-combination.
- Little tern; breeding; 45 pairs;
 - Screened out for all types of potential effects alone and in-combination.

- Puffin; breeding; 54,242 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Roseate tern; breeding; 80 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Sandwich tern; breeding; 2,162 pairs; and
 - Screened out for all types of potential effects alone and in-combination.
- Breeding seabird assemblage; Arctic tern, black-headed gull, common tern, cormorant, guillemot, kittiwake, little tern, puffin, roseate tern, Sandwich tern and shag.
 - Only guillemot screened in, all other assemblage species screened out for all types of potential effects as listed above.

9.17.3 The Conservation Objectives for the site were provided by Natural England in 2016⁵⁸ as follows:

Conservation Objectives

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

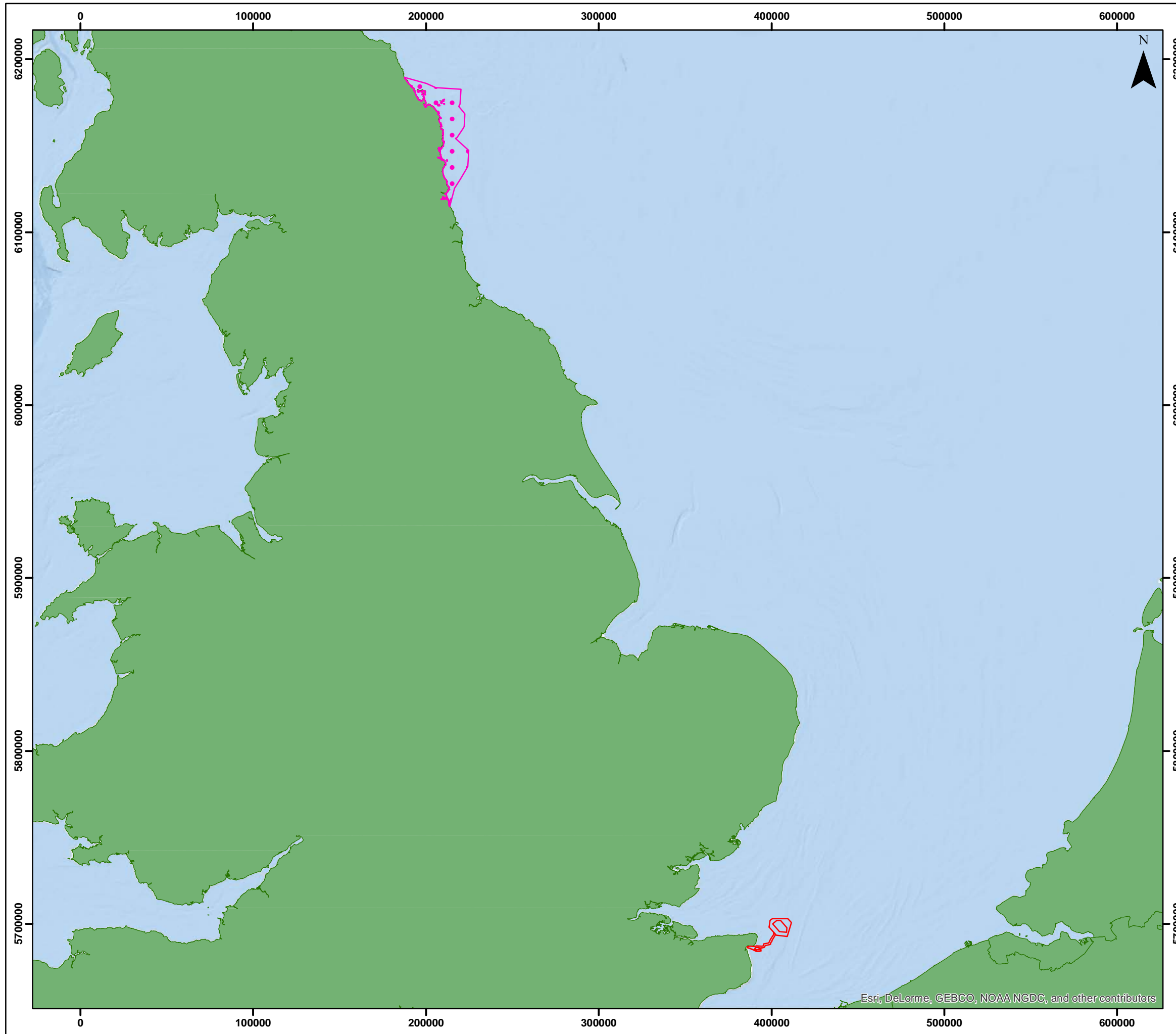
Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- 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.

⁵⁶<https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9020325&SiteName=northumberland&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=>



⁵⁷ <http://incc.defra.gov.uk/pdf/SPA/UK9020325.pdf>

⁵⁸ <http://publications.naturalengland.org.uk/publication/4891545554649088>

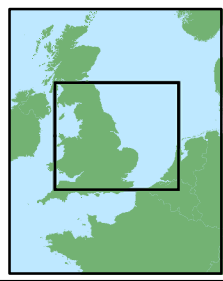


**THANET EXTENSION
OFFSHORE WIND FARM**

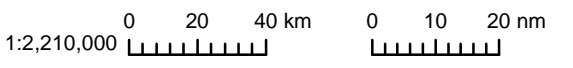
Figure 9.16
Northumberland Marine
SPA in Relation to Thanet
Extension

- Legend**
-  Offshore Red Line Boundary
 -  Northumberland Marine SPA

Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig9.16_Northumberland			Figure 9.16
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

9.18 Farne Islands SPA

9.18.1 The Farne Islands SPA is a 101 ha area of coastal habitat supporting breeding seabirds in Northumberland. The interest features of the site are described in the following documents:

- Natura 2000 standard data form⁵⁹.

9.18.2 The interest features of this site are listed below along with the population for which the classification was made, [whether the population is in favourable conservation status] and whether or not that interest feature was screened in or not based on individual effect categories and LSE.

- Arctic tern; breeding; 2,840 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Common tern; breeding; 230 pairs;
 - Screened out for all types of potential effects alone and in-combination.
- Guillemot; breeding; 32,875 pairs;
 - Screened in for potential disturbance and displacement at the construction stage alone;
 - Screened in for potential disturbance and displacement at the operational stage alone;
 - Screened in for potential disturbance and displacement at the offshore cable construction stage in-combination; and
 - Screened in for potential disturbance and displacement at the operational stage in-combination.
- Sandwich tern; breeding; 2,070 pairs; and
 - Screened out for all types of potential effects alone and in-combination.
- Breeding seabird assemblage; cormorant, shag, kittiwake and puffin, roseate tern.
 - Only guillemot screened in, all other assemblage species screened out for all types of potential effects as listed above.

9.18.3 The Conservation Objectives for the site were provided by Natural England in 2014⁶⁰ as follows:

Conservation Objectives

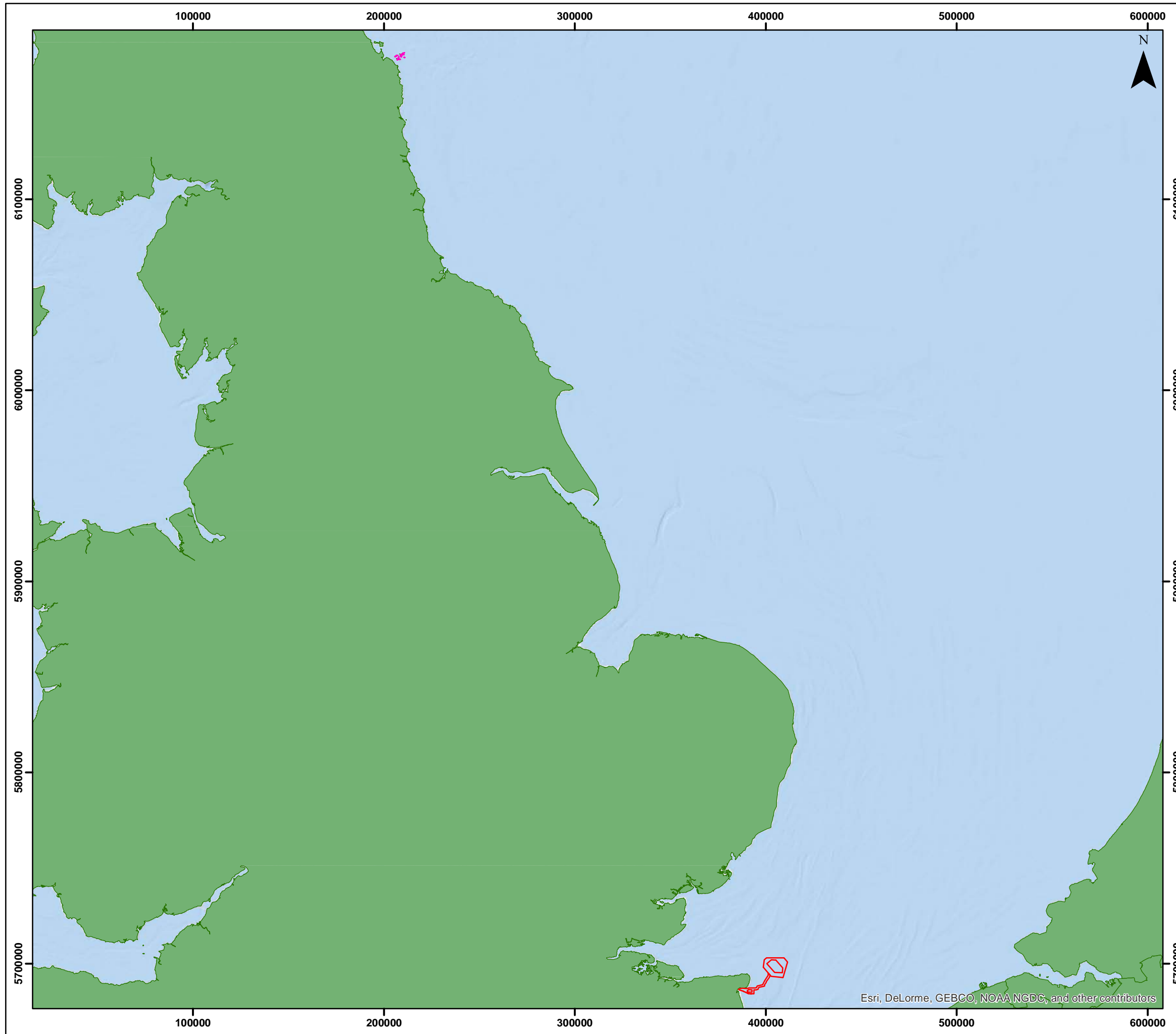
With regard to the SPA and the individual species and/ or assemblage of species for which the site has been classified (the 'Qualifying Features'), and subject to natural change;

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.

⁵⁹ <http://jncc.defra.gov.uk/pdf/SPA/UK9006021.pdf>

⁶⁰ <http://publications.naturalengland.org.uk/publication/4521874151178240>

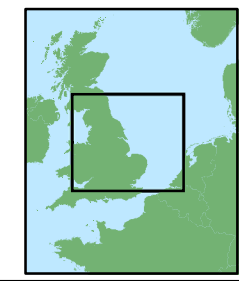


THANET EXTENSION OFFSHORE WIND FARM

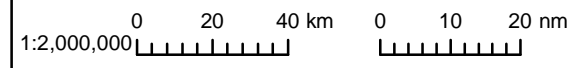
Figure 9.17
Farne Islands SPA in
Relation to Thanet
Extension

- Legend**
- Offshore Red Line Boundary
 - Farne Islands SPA

Datum: ETRS 1989
Projection: UTM31N



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**Figure
9.17**

10 Assessment criteria

- 10.1.1 The assessment approach being applied here is to first summarise each designated site screened in for LSE in turn, highlighting the feature(s) screened in together with the site's conservation objectives and the effects identified as resulting in LSE. To minimise the potential for repetition, the determination of AEoI that follows is made on a receptor by receptor basis – however the relevant sites (and their features) are identified for each receptor, together with the relevant effects.
- 10.1.2 The nature of each relevant effect is then described (e.g. in terms of scale, duration, frequency, etc), drawing on the relevant project literature to minimise repetition, and summarising the relevant conclusion from the ES. A conclusion on AEoI is then drawn for each site feature screened in for LSE, with these conclusions summarised on a site by site basis in Table 7.3.

10.2 Subtidal and benthic intertidal habitats

- 10.2.1 The RIAA has been prepared in accordance with Advice Note 10: Habitats Regulations Assessment Relevant to Nationally Significant Infrastructure Projects (PINS, 2016), with the method for determining potential impact with respect to subtidal and intertidal benthic ecology being compliant with the Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines (CIEEM, 2016).
- 10.2.2 The assessment criteria and conclusions presented within section 10 of the ES Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology have been drawn on to inform this report when considering the potential for adverse effects on site integrity with respect to intertidal and benthic ecology features, with the ES conclusions on significance being considered here specifically in the context of the conservation objectives of the designated sites being assessed. The final assessment for each effect is based upon expert judgement. Where possible, parameters are quantified and predicted changes presented.

- 10.2.3 Full detail of the assessment criteria and assignment of significance applied within the ES are provided within that chapter, and take account of the following:
- Sensitivity/ importance of the environment (drawing on MarLIN and MARESA sensitivity categories^{61, 62});
 - Magnitude of impact (the degree of change from baseline, in terms of: spatial extent, duration, timing, seasonality and/ or frequency);
 - Significance of potential effect in terms of major/ moderate/ minor and negative/ beneficial (defined in a matrix combining sensitivity and magnitude).
- 10.2.4 Where the assessment being made relates to intertidal habitats as habitats used by the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar, the habitat assessment follows the approach relevant to subtidal and benthic intertidal habitats. The subsequent consideration of the potential for an indirect effect on the designated species of the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar takes account of the assessment criteria and assignment of significance applied in Volume 3, Chapter 5: Onshore Biodiversity Chapter (Document Ref 6.3.5) of the ES, as noted below.

10.3 Marine Mammals

- 10.3.1 As noted in section 5, certain assumptions have been made regarding disturbance in harbour porpoise that may arise as a result of various activities that generate noise. As regards piling, these assumptions have drawn on a body of literature, namely Dahne *et al.* (2013) and Tougaard *et al.* (2014), the latter being a report produced by an expert group convened under the Habitats and Wild Birds Directives – Marine Evidence Group. The Tougaard *et al.* (2014) report drew on a number of empirical sources, including Dahne *et al.* (2013), but also Brandt *et al.* (2011), Brandt *et al.* (2012) (contained within Popper & Hawkins (2012)), Braasch *et al.* (2013), Thompson *et al.* (2010) and Bailey *et al.* (2010). These studies reported direct observations during wind farm construction, thus enabling an Effective Deterrent Radius (EDR) to be established. The EDR is defined by Tougaard *et al.* as reflecting the overall loss of habitat that would occur if all animals vacated an area with a radius of the EDR around the pile driver, being equivalent to the mean loss of habitat per animal. More noise-tolerant animals will lose less than this mean area, while less noise-tolerant animals would lose more.

⁶¹ <https://www.marlin.ac.uk/species/MarLIN-sensitivity-methods>

⁶² http://www.marlin.ac.uk/species/sensitivity_rationale

- 10.3.2 For seismic survey, the relevant EDR is less clear. The draft conservation advice published in January 2016 identified a range of 5 km for seismic surveys. The range was later called into question following the submission of the shadow HRA for Hornsea Project One in 2016. The use of a 10 km range for seismic survey, as considered in the OESEA 3 was noted (although it is pertinent to note that the 10 km range applied in the OESEA 3 was in relation to the firing of small air guns and is therefore not considered typical of all types of seismic survey and particularly the types typically used for offshore wind farm site investigation work). The 2013 Thompson *et al.* paper (which investigated short-term disturbance of harbour porpoise from an air gun survey) found avoidance movements in harbour porpoise within a 5-10 km range of the seismic vessel. It is, therefore, clear that a blanket application of 10 km EDR for all geophysical and seismic survey is unlikely to be appropriate, and that project specific circumstances should be taken into account.
- 10.3.3 No formal EDR information has been provided for explosion of UXO, although Natural England did reference the 26 km value for UXO clearance in their East Anglia THREE letter of 28th September 2016 and confirmed at the Thanet Extension Steering Group meeting on 2nd October 2017 that the advice has not changed.
- 10.3.4 A suitably precautionary radius of disturbance from the above specific sources of noise has therefore been established in terms of an EDR, with agreement from Natural England at the Evidence Plan meeting on 2nd October 2017 that these EDRs represent a reasonable approach. The EDRs applied are as follows:
- An EDR of 26 km from the location of piling;
 - A range of EDRs for seismic survey, being 5 or 10 km from the location of seismic activity; and
 - An EDR of 26 km from UXO clearance.
- 10.3.5 For seals, the approach followed applies that used within the ES (Volume 2: Chapter 7: Marine Mammals (Document Ref: 6.2.7) to determine the numbers of seals that may be affected as part of the overall population within the study area.
- 10.3.6 The determination of AEoI with regards marine mammals draws on the existing project literature, to provide the required information on the baseline environment (both locally and across the North Sea management unit).

10.4 Offshore Ornithology

- 10.4.1 The assessment has been based on the relevant guidance for conducting HRA and assessing OWFs (e.g. European Commission, 2011; Maclean *et al.*, 2009; Natural England, 2010; PINS Advice Note Ten) and applied the criteria contained in that guidance where relevant to the interest features under consideration.
- 10.4.2 The screening criteria applied are precautionary and are:

- the occurrence of the species, as shown by the baseline surveys, in more than trivial numbers (where 'trivial' was single figures over the duration of the surveys) within the Thanet Extension survey area (this covered TOWF, Thanet Extension proposed array and the area covered by a distance of 4 km projected around the proposed array);
 - the species has been identified as sensitive to displacement and disturbance in relevant guidance (Bradbury *et al.*, 2014; Furness and Wade 2012; Furness *et al.*, 2013); and
 - the species has been identified as sensitive to collision risk in relevant guidance (Bradbury *et al.*, 2014; Furness and Wade 2012; Furness *et al.*, 2013).
- 10.4.3 The determination of AEoI is based on the factors that contribute to the definition of maintaining integrity, namely that the ecological structure and function of the site is not adversely affected, that the ability of the habitat to sustain the bird species that are interest features is not adversely affected (i.e. that breeding, roosting and foraging locations are maintained and that food sources are maintained) and that the population of the interest feature is maintained both in numbers and across the area of the site. Where relevant, the long-term viability of the population has been assessed using population modelling.

10.5 Onshore Biodiversity

- 10.5.1 The RIAA has been prepared in accordance with Advice Note 10: Habitats Regulations Assessment Relevant to Nationally Significant Infrastructure Projects (Planning Inspectorate, 2016), with the method for determining potential effects with respect to onshore biodiversity based on the CIEEM guidelines (CIEEM, 2016).
- 10.5.2 The assessment criteria and conclusions presented within sections 5.10-5.12 of the ES Volume 3, Chapter 5, Onshore Biodiversity (Document Ref: 6.3.5) have been drawn on to inform this report when considering the potential for adverse effects on site integrity with respect to onshore biodiversity features. The ES conclusions on significance are considered here specifically in the context of the conservation objectives of the designated sites being assessed. Full detail of the assessment criteria and assignment of significance applied within the ES are provided within Volume 3, Chapter 5, Onshore Biodiversity (Document Ref: 6.3.5).

11 Assessment of Adverse Effect Alone

11.1.1 Where a LSE on a European site has been identified, there is a requirement to consider whether those effects will adversely affect the integrity of the site in view of its conservation objectives. The conclusion on LSE for Thanet Extension alone is presented in Table 7.3, with the conservation objectives for all relevant sites provided in section 9 and receptors screened in provided in section 7. The information is presented below according to the following receptor groupings:

- Subtidal and Benthic Intertidal Habitats;
- Marine Mammals;
- Offshore Ornithology; and
- Onshore Biodiversity.

11.2 Subtidal and Benthic Intertidal Habitats

11.2.1 A description of the significance of project level effects upon the receptors grouped under 'subtidal and benthic intertidal habitats', as relevant to the designated sites and their associated features screened in for LSE, is provided below. All designated sites screened in, including the features and effects for which potential for LSE has been concluded, are summarised in Table 7.3.

Construction and Decommissioning

Temporary Habitat Loss and Disturbance

11.2.2 The potential for an AEol as a result of temporary habitat loss on subtidal and benthic intertidal habitats during construction and decommissioning relates to the following designated sites and the relevant features (i.e. those features screened in for LSE):

- Thanet Coast SAC;
 - Chalk reefs.
- Thanet Coast & Sandwich Bay SPA; and
 - Intertidal habitats used by ruddy turnstone (Non-breeding); and
 - Intertidal habitats used by European golden plover (Non-breeding).
- Thanet Coast & Sandwich Bay Ramsar.
 - Ramsar Criterion 6 – intertidal habitats used by species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

11.2.3 For both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar sites, the potential for AEol relevant to intertidal habitats arises from the potential effect on intertidal habitats used by qualifying species.

11.2.4 Offshore, there is potential for temporary habitat loss and disturbance due to the installation of structures (i.e. possible cable protection and permanent moorings), cable laying operations (including anchor placements) and seabed preparation. Within the intertidal, temporary loss/ disturbance of habitat will occur from cable laying operations and the works at the landfall Table 5.2: Maximum project design scenario

11.2.5 outlines the design envelope and the maximum adverse scenario for intertidal and subtidal benthic ecology, with the total change for subtidal and intertidal benthic habitats highlighted below. The potential for permanent habitat loss is addressed under the operational and maintenance stage.

11.2.6 None of the designated sites screened in for LSE for habitat loss/ disturbance overlap with the WTG array, but Thanet Coast SAC overlaps with the OECC and both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar interact with the cable corridor where it passes through the intertidal area. The assessment of potential for AEol in relation to direct temporary habitat loss/ disturbance during construction and decommissioning is therefore limited to these sites and relevant project scenarios.

11.2.7 The total maximum area of temporary subtidal habitat loss due to construction activities described in Table 5.2 is predicted to be approximately 1,594,629 m² (1.59 km²). This equates to 0.13% of the total seabed area within the wider Thanet Extension benthic ecology study area (1,230.5 km²), the large proportion of which falls outside of a designated site.

11.2.8 Within the subtidal, of the total temporary habitat disturbance described in Table 5.2, a maximum of 1,490,400 m² (1.49 km²) will be temporarily disturbed within the subtidal areas of the Thanet Extension OECC as a result of cable burial and associated anchor placements. This equates to 0.12% of the total seabed area within the wider Thanet Extension benthic study area. Again, the vast proportion of that falls outside any designated site.

11.2.9 Within the intertidal, both saltmarsh and the muddy foreshore will be temporarily disturbed during construction, comprised of some 80,000 m² of intertidal foreshore (during trenching) and 4,703 m² of saltmarsh (combination of trenching and the cofferdam).

11.2.10 During decommissioning, direct disturbance due to operations to remove foundations, inter-array cables, export cables (including use of jack-up vessels) equates to the total subtidal temporary habitat loss of 428,071.5 m² (noting that only a proportion of this relates to the OECC and only a proportion of that would fall within a designated site); and total intertidal temporary habitat loss of 80,000 m².

11.2.11 A description of the significance of temporary habitat loss or disturbance upon all benthic subtidal and intertidal receptors during construction and decommissioning phases is provided in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5). The relevance to the designated sites screened in for LSE is determined below.

Thanet Coast SAC

11.2.12 For the Thanet Coast SAC, the designated feature screened in for LSE in relation to habitat loss and disturbance is chalk reefs. The OECC (not including the cable exclusion area, since cables would not be installed in that area in any case) overlaps with 0.14 km² of the SAC, approximately 0.5% of the total SAC extent. The area of overlap effectively forms a narrow strip that skirts along the edge of the SAC boundary, being at most ~106m at its widest point (towards the western end), before narrowing to 9m at the western end. The narrow width of the overlap places limits on the cabling that would be technically feasible to install within this section of the OECC – this is in addition to the mitigation afforded through preconstruction surveys and the biogenic reef mitigation plan, the result of which will mean that should any chalk reef be detected then micrositing will ensure no direct loss of the chalk reef feature. Even should the OECC, as installed, overlap the SAC boundary (as noted above only a small amount of the RLB falls within the SAC and therefore the OECC may fall wholly outside the SAC boundary), only a fraction of that 0.14 km² would be directly disturbed. The total area within the SAC that might be affected would be within the cable corridor, requiring up to four trenches each 10 m wide (noting that the width of the overlap is not sufficiently wide along its full length to accommodate that), running across the maximum distance possible of 2.5 km. The result, which is an overestimate of that which would technically be feasible, would be up to approximately 0.1 km² of the Thanet Coast SAC, equating to approximately 0.36% of the total SAC.

11.2.13 The site specific surveys undertaken (Fugro, 2017a, b; Volume 4, Annex 5-2, Document Ref: 6.4.5.2), including the drop down video, were designed to identify any features of nature conservation importance. No chalk reef features were identified within the site specific surveys within either the array or OECC.

11.2.14 Of note, the site specific surveys also considered the potential for *Sabellaria spinulosa* reef, although not a designated feature of the SAC. No *S. spinulosa* reef was identified within the proposed development area for Thanet Extension in the baseline surveys (Volume 4, Annex 5-2 (Document Ref: 6.4.5.2)). However, as part of the embedded mitigation for the project, pre-construction surveys will be undertaken in advance of construction and the presence or absence of *S. spinulosa* reefs will be confirmed and any core reef will then be subject to the Biogenic Reef Mitigation Plan. The mitigation plan will ensure that any impacts to core reef are avoided. Should chalk reefs be identified during these surveys, then these would similarly be included within the Biogenic Reef Mitigation Plan.

11.2.15 There will therefore be no direct temporary loss or disturbance of the designated feature 'chalk reef' for the Thanet Coast SAC during construction or decommissioning and, therefore, there is no AEoI to the chalk reef feature of the Thanet Coast SAC in relation to temporary loss or disturbance from Thanet Extension alone and therefore, subject to natural change, the chalk reef feature will be maintained in the long-term.

Thanet Coast and Sandwich Bay SPA

11.2.16 Temporary habitat loss/ disturbance will occur during construction and decommissioning within the intertidal habitats, which include the saltmarsh and the mudflat foreshore. These habitats represent potential roosting and feeding habitats for the designated bird species European golden plover and ruddy turnstone within the Thanet Coast and Sandwich Bay SPA. Temporary disturbance will occur in both the intertidal foreshore and the saltmarsh habitat, with 80,000 m² of the intertidal foreshore disturbed (0.71% of the total intertidal foreshore habitat within the SPA) and 4,703 m² of saltmarsh habitat disturbed (approximately 0.34% of the total saltmarsh habitat within the SPA). The works will be undertaken wholly between April to September inclusive, to avoid the October to March period which is directly sensitive to the ruddy turnstone and European golden plover features of the Thanet Coast and Sandwich Bay SPA, with the potential for disturbance in relation to the habitats therefore following construction as these habitats recover.

11.2.17 Saltmarsh is common throughout Pegwell Bay and is present throughout the study area, including further south towards Sandwich Bay. Given that the intertidal habitats are common and widespread throughout the region, the area directly affected represents a very small footprint compared to their overall extent. It is also of note that recent monitoring surveys indicate that following the TOWF installation the saltmarsh feature reverted to its pre-construction status with no significant change being found after two years. Through discussion within the evidence plan (12th July 2017) it has also been confirmed that the saltmarsh is, in areas around the proposed landfall, well established and as such less diverse than the patchier *Salicornia* saltmarsh to the north, in proximity to the hoverport.

- 11.2.18 The intertidal zone within Pegwell Bay consists of mobile sediments with some restricted sediment scour. The communities that characterise these biotopes are predominantly infaunal mobile species including polychaetes and bivalves, which are capable of re-entering the substratum following disturbance. The species and habitats identified during the intertidal characterisation surveys (LS.LSa.FiSa⁶³, LS.LSa.MuSa.CerPo⁶⁴ and LS.LSa.MuSa⁶⁵) are typical of the wider region of the surrounding area. All three biotopes have been assessed according to the MarLIN or MarESA criteria as having a high or medium recoverability (resilience) to direct disturbance, with the habitats directly affected considered to generally have low sensitivity to disturbance of this nature.
- 11.2.19 While it is likely that some of the characterising species (*Macoma balthica* and *Arenicola marina*) would be damaged by the physical impacts of the trench excavation in the intertidal, both species are able to recolonise disturbed habitat rapidly. Particularly in the case of *M. balthica*, following sediment removal (dredging) within the area, recovery of the population within the disturbed area had recovered to the same as the unaffected areas. Within one year, two generations could be identified, showing that recovery was both from adults migrating into the area and larval recruitment (Bonsdorff, 1984).
- 11.2.20 To mitigate against any temporary loss or disturbance, as part of the mitigation measures embedded into the Thanet Extension development, and as part of the application, a Saltmarsh Mitigation, Reinstatement and Monitoring Plan (SMRMP) has been produced (Document Ref: 8.13), which will be developed and agreed with the relevant stakeholders. A Phase 1 walkover survey will be undertaken of the intertidal area to provide an up-to-date assessment and delineation of sensitive habitats present to provide the basis for the SMRMP refinement. This plan will detail how trenched material will be stored in order to facilitate reinstatement. The resulting impacts to the saltmarsh will be localised and short-term, with the SMRMP ensuring that impacts are kept to an absolute minimum.

- 11.2.21 The conservation objectives for the SPA require maintenance of the extent and distribution of the habitats of the qualifying features, and the structure and function of the habitats of the qualifying features. The impacts resulting from temporary habitat loss/ disturbance will be temporary and of short-term duration, extending across a very small proportion of the available habitat and with only a single event in each location; therefore, the magnitude of the impact is assessed as low for the saltmarsh and mudflat foreshore and the sites conservation objectives will be maintained in the long-term.
- 11.2.22 There is, therefore, no potential for AEoI to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay SPA in relation to temporary habitat loss/ disturbance during construction and decommissioning from Thanet Extension alone and therefore, subject to natural change, the intertidal habitats of the designated ruddy turnstone and European golden plover features will be maintained in the long-term with respect to the potential for effect from temporary habitat loss and disturbance.

Thanet Coast and Sandwich Bay Ramsar

- 11.2.23 Temporary habitat loss/ disturbance will occur during construction and decommissioning within the intertidal habitats, which include saltmarsh and the mudflat foreshore. These habitats represent potential roosting and feeding habitats for the ruddy turnstone designated bird species within the Thanet Coast and Sandwich Bay Ramsar. The potential for an effect on ruddy turnstone is assessed above as part of the consideration of the Thanet Coast and Sandwich Bay SPA; that assessment applies equally to the ruddy turnstone feature of the Thanet Coast and Sandwich Bay Ramsar and is therefore not repeated here.

⁶³ <https://www.marlin.ac.uk/habitats/detail/1125> - biotope Polychaetes in littoral fine sand (LS.LSa.FiSa.Po) has been used to provide the MarESA assessment for this biotope. LS.LSa.FiSa.Po is a sub-biotope of LS.LSa.FiSa, however the characterising species of the two biotopes are identical and the sensitivity assessment is therefore considered appropriate for use alongside expert judgement of the impacts on this biotope.

⁶⁴ <http://www.marlin.ac.uk/habitats/detail/206>

⁶⁵ <https://www.marlin.ac.uk/habitats/detail/21> - a MarESA assessment has not been carried out for this species, so the evidence from the MarLIN assessment has been used.

11.2.24 There are no conservation objectives for the Thanet Coast and Sandwich Bay Ramsar, however the conservation objectives for the SPA require maintenance of the extent and distribution of the habitats of the qualifying features, and the structure and function of the habitats of the qualifying features. The impacts resulting from temporary habitat loss/ disturbance will be temporary and of short-term duration, extending across a very small proportion of the available habitat and with only a single event in each location; therefore, the magnitude of the impact is assessed as low for the saltmarsh and mudflat foreshore and the site will be maintained in the long-term. Further, the embedded mitigation as regards the timing of works will occur during the period April to September inclusive, to avoid the winter period considered directly important to the designated ruddy turnstone feature of the Thanet Coast and Sandwich Bay Ramsar, with the potential for disturbance in relation to the intertidal habitat therefore following construction as these habitats recover.

11.2.25 There is, therefore, no potential for AEol to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay Ramsar in relation to temporary habitat loss/ disturbance during construction and decommissioning from Thanet Extension alone and therefore, subject to natural change, the intertidal habitats and the designated ruddy turnstone feature will be maintained in the long-term with respect to the potential for effect from temporary habitat loss and disturbance.

Increased suspended sediment and associated deposition

11.2.26 The potential for an AEol as a result of an increase in SSC and subsequent deposition on subtidal and benthic intertidal habitats during construction and decommissioning relates to the following designated sites and the relevant features (i.e. those features screened in for LSE):

- Thanet coast SAC;
 - Chalk reefs.
- Margate and Long Sands SAC;
 - Sand banks which are slightly covered by sea water all the time.
- Thanet Coast & Sandwich Bay SPA.
 - Intertidal habitats used by ruddy turnstone (Non-breeding); and
 - Intertidal habitats used by European golden plover (Non-breeding).
- Thanet Coast & Sandwich Bay Ramsar.
 - Ramsar Criterion 6 – Intertidal habitats used by species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

11.2.27 For both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar sites, the potential for AEol relevant to intertidal habitats arises from the potential effect on the qualifying bird species.

11.2.28 There is the potential for a temporary increase in SSCs and subsequent deposition to result from construction operations; such as cable laying operations, foundation installations and seabed preparation. The temporary, intermittent and localised increase in SSCs can affect the benthos e.g. through lower light levels, with deposition potentially leading to smothering.

11.2.29 Temporary increases in SSC and associated sediment deposition are expected from the foundation and cable installation works and seabed preparation works. Volume 2, Annex 2-1: Marine Geology, Oceanography and Physical Processes Technical Report (Document Ref: 6.4.2.1) provides a full description of the physical assessment, with a summary of the existing baseline and the maximum design scenarios associated with the impact summarised below.

11.2.30 SSC in the southern North Sea varies widely both spatially and temporally, with a general pattern of an inshore to offshore gradient in SSC. The highest SSCs are observed close to the mouths of large estuaries, such as the Thames. Within the array area of Thanet Extension, surface SSCs average more than 10 mg/l over the year, with levels in the winter generally being between 30 – 80 mg/l although up to 100 mg/l has been recorded. Within the OECC, surface SSCs are between 10 – 20 mg/l during summer and above 40 mg/l during winter. Significantly higher levels may be seen during storm events.

11.2.31 SSCs may reach thousands of mg/l during seabed preparation within the array, however this will be only short-term during the settling stage of the plume. The passive stage of the plume may result in SSCs up to hundreds of mg/l for up to two hours, with the contribution of the works to SSCs reducing to less than 5mg/l within 24 hours, which is within natural variation. Cable installation works may result in SSCs of up to 10mg/l above background levels up to 10 km from the cable route, however, this is within natural variation for the area. Sediment deposition will be concentrated within a few 100 m of the works, with fine grained material dispersed more widely and will not settle with measurable thickness. Deposition arising from the cable installation may result in sediment deposition of an average of 0.05 m within approximately 75 m of the cable route, with fine grained material dispersed more widely that will not settle with measurable thickness.

11.2.32 SSCs of between 5 – 10 mg/l are expected to extend to a distance of 10 km from the dredging/ mass flow excavator site. The impacts of sediment deposition are not known at this stage as the volume of material that would need to be removed is unknown. However, the extent of any deposition would be restricted to the local area (tens to hundreds of metres) and local accumulations would be subject to redistribution under prevailing hydrodynamic conditions.

11.2.33 The scenario that results in the greatest impact on intertidal habitats from cable installation is ploughing and the associated formation of berms. While these berms are present on the beach, they will be subject to tidal dispersion, although some of this will result in natural backfill of the trench. It is expected that the berms would be present for only a very short period of time and so the degree of redistribution that may occur is highly limited. SSCs will be increased locally but rapidly attenuate to natural levels.

11.2.34 After the trench has been backfilled, it is expected that re-working by waves and currents will quickly (in the order of days to weeks) redistribute and smooth any remaining local disturbances. As such all impacts will be short-term and highly localised.

Thanet Coast SAC

11.2.35 The magnitude of the impact as regards subtidal ecology has been assessed within the ES (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)) as low, with the maximum sensitivity of the receptors being medium. Therefore, the significance of effect from changes in SSC and associated sediment deposition in the subtidal areas was concluded to be minor, which is not significant in EIA terms. Furthermore, the post-construction surveys undertaken for TOWF identified that changes in faunal composition between pre- and post-construction were only as a result of natural variation, suggesting no long-term impacts from increased SSC or increased sediment deposition (MESL, 2013). As such, the assessment of the significance of effects as not significant remains valid.

11.2.36 Although impacts are predicted to be low, there is potential for the sediment released to reach the Annex I habitat (chalk reef) qualifying feature of the Thanet Coast SAC. The Regulation 33 document for the North East Kent Coast EMS⁶⁶ (which includes the Thanet Coast SAC) finds the following in relation to the chalk reefs and siltation:

'The communities found on the reefs around Thanet are however, naturally tolerant of a degree of siltation due to the relatively high sediment load in the water column. Because of this, the reefs of the Thanet coastline are considered to be of a low sensitivity to physical damage through siltation.'

11.2.37 It is therefore considered that, given the short-term and temporary nature of the change, the existing levels of SSC in the area, the ES conclusion of minor significance and the known low sensitivity of the chalk reef feature to siltation, it is concluded that the sites conservation objectives will be maintained in the long-term. There is, therefore, no AEoI to the chalk reef feature of the Thanet Coast SAC in relation to temporary and short-term increased SSC and associated deposition from Thanet Extension alone during construction and decommissioning and therefore, subject to natural change, the chalk reef feature will be maintained in the long-term.

Margate and Long Sands SAC

11.2.38 The magnitude of the impact as regards subtidal ecology has been assessed within the ES (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)) as low, with the maximum sensitivity of the receptors being medium. Therefore, the significance of effect from changes in SSC and associated sediment deposition in the subtidal areas was concluded to be minor, which is not significant in EIA terms. Furthermore, the post-construction surveys undertaken for TOWF identified that changes in faunal composition between pre- and post-construction were only as a result of natural variation, suggesting no long-term impacts from increased SSC or increased sediment deposition (MESL, 2013). As such, the assessment of the significance of effects as not significant remains valid.

11.2.39 Although impacts are predicted to be low, there is potential for the sediment released to reach the Annex I habitat (sand banks which are slightly covered by sea water all the time) qualifying feature of the Margate and Long Sands SAC. The array boundary for Thanet Extension is approximately 3 km from the boundary of the SAC, and therefore beyond the 560 m range for 0.05 m deposition highlighted in the ES (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)). Any short-term and temporary increase in SSC levels that reaches the SAC boundary will be reduced from the nearfield maximum, together with a reduced potential for deposition.

⁶⁶ <http://publications.naturalengland.org.uk/file/3229392>

11.2.40 The Regulation 35 Advice on Activities for the SAC⁶⁷ considers the vulnerability of the site to non-toxic contamination, specifically an increase in turbidity, concluding a low vulnerability (vulnerability being a function of sensitivity and exposure).

11.2.41 Given the short-term and temporary nature of the effect, combined with the existing SSC levels in the region, low vulnerability of the feature and lack of long-term impacts found following the construction of the TOWF, it is concluded that the sites conservation objectives will be maintained in the long-term. There is, therefore, no AEoI to the sand banks which are slightly covered by sea water all the time feature of the Margate and Long Sands SAC in relation to increased SSC and associated deposition from Thanet Extension alone during construction and decommissioning and therefore, subject to natural change, the sand banks which are slightly covered by sea water all the time feature will be maintained in the long-term.

Thanet Coast and Sandwich Bay SPA

11.2.42 Within the ES, the magnitude of the impact of an increase in SSC and subsequent deposition on the intertidal has been assessed as low, with the maximum sensitivity of the receptors being medium. Therefore, the significance of effect from changes in SSC and associated sediment deposition occurring as a result of cable installation activities in the intertidal area is concluded to be minor, which is not significant in EIA terms.

11.2.43 The species and habitats identified during the intertidal characterisation surveys (LS.LSa.FiSa, LS.LSa.MuSa.CerPo and LS.LSa.MuSa) are typical of the wider region of the surrounding area. All three biotopes have been assessed according to the MarLIN and MarESA criteria as having a high recoverability to changes in SSC, high recoverability to 'light' sediment deposition (5 cm) and a high to medium recoverability to 'heavy' sediment deposition (> 5 cm).

11.2.44 In addition, the intertidal zone of Pegwell Bay within the landfall area is an accretion zone, with sediment received from natural supplies including updrift, offshore and fluvial sources. While sands and silts are transported into Pegwell Bay on tidal currents, the majority of sediment transport occurs during storm surge events, with shingle movement, flattening of areas and berm creation in others. Therefore, the habitats identified within the landfall area will likely have a low intolerance to these impacts.

11.2.45 Given the habitats are naturally accreting and increases to SSCs will be local and rapidly attenuate to natural levels, the conservation objectives for the SPA, to ensure that the integrity of the site is maintained or restored, by maintaining or restoring the extent and distribution of the intertidal habitats of the qualifying species and overall structure and function of the habitats will not be compromised.

11.2.46 There is, therefore, no AEoI to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay SPA in relation to the short-term and temporary increased suspended sediments and deposition effects from Thanet Extension alone during construction and decommissioning and therefore, subject to natural change, the intertidal habitats for the designated ruddy turnstone and European golden plover features will be maintained in the long-term with respect to the potential for effect from an increase in SSC and subsequent deposition.

Thanet Coast and Sandwich Bay Ramsar

11.2.47 The potential for an effect on ruddy turnstone is assessed above as part of the consideration of the Thanet Coast and Sandwich Bay SPA; that assessment applies equally to the ruddy turnstone feature of the Thanet Coast and Sandwich Bay Ramsar and is therefore not repeated here.

11.2.48 Although the Ramsar site does not have conservation objectives, the conservation objectives of the SPA can be applied, to ensure that the integrity of the site is maintained or restored, by maintaining or restoring the extent and distribution of the habitats of the qualifying species and overall structure and function of the habitats will not be compromised.

11.2.49 There is, therefore, no AEoI to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay Ramsar in relation to the short-term and temporary increased suspended sediments and deposition effects from Thanet Extension alone during construction and decommissioning and therefore, subject to natural change, the intertidal habitats for the designated ruddy turnstone feature will be maintained in the long-term with respect to the potential for effect from an increase in SSC and subsequent deposition.

⁶⁷ <http://publications.naturalengland.org.uk/file/3271272>

Operations and Maintenance*Permanent physical habitat loss and temporary habitat loss/disturbance*

11.2.50 The potential for an AEoI as a result of permanent physical habitat loss in the subtidal habitats and temporary habitat loss/disturbance on subtidal and benthic intertidal habitats during O&M relates to the following designated sites and the relevant features (i.e. those features screened in for LSE):

- Thanet coast SAC;
 - Chalk reefs.
- Thanet Coast & Sandwich Bay SPA;
 - Intertidal habitats used by ruddy turnstone (Non-breeding); and
 - Intertidal habitats used by European golden plover (Non-breeding).
- Thanet Coast & Sandwich Bay Ramsar.
 - Ramsar Criterion 6 – Intertidal habitats used by species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

11.2.51 For both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar sites, the potential for AEoI relevant to intertidal habitats arises from the potential effect from temporary habitat loss/ disturbance on habitats used by qualifying bird species. Table 5.2 identifies that no substantive maintenance work is expected along the intertidal cables, with any temporary disturbance resulting from periodic preventative maintenance, likely to be yearly inspections together with any requirements following extreme events such as storms.

11.2.52 The potential for subtidal habitat loss in relation to the designated sites and their relevant features screened in above is limited to works within the OECC, specifically within the section which passes through the Thanet Coast SAC. As described in Table 5.2 a total of 290,000 m² of cable protection will be installed along the entire stretch of the cable route, which equates to 0.02% of the wider benthic study area.

11.2.53 During O&M, temporary subtidal habitat disturbance will result from the use of jack-up vessels together with preventative maintenance of cables and potential need for cable repair or reburial.

11.2.54 A description of the significance of permanent habitat loss or disturbance upon all benthic subtidal and intertidal receptors during O&M phases is provided in Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5). The relevance to the designated sites screened in for LSE is determined below.

Thanet Coast SAC

11.2.55 Although a short section of the OECC falls partially within the Thanet Coast SAC (an overlap of 0.8 km², approximately 2.8% of the total SAC extent of which the cable could be installed along a maximum length of 2.5 km, resulting in a maximum area of temporary disturbance during construction of 0.1 km²), the site specific surveys have not identified the presence of the designated chalk reef feature. Even should the OECC as installed overlap the SAC boundary and cable protection be required along that length (only a small amount of the RLB falls within the SAC and therefore the OECC may fall outside the SAC boundary), only a fraction of that 0.1 km² would be directly affected. Similarly, although provision is made within the project description for cable repair and reburial, the maximum extent of the Thanet Coast SAC that could be affected during the operation and maintenance of the OECC remains the same as during construction.

11.2.56 Given the absence of the sublittoral chalk reef feature within the footprint of the project, combined with the Biogenic Reef Mitigation Plan referred to in Table 6.1, the OECC will not result in the permanent loss of any chalk reef feature nor is there potential for disturbance to any chalk reef feature should any cable repair or reburial be required. Further, should any maintenance be required along the length of the OECC that falls within (or in close proximity to) the Thanet Coast SAC, appropriate measures would be taken to ensure no loss of any chalk reef feature, with these to be determined in relation to the required works and the results of any surveys undertaken at the time.

11.2.57 There will, therefore, be no direct permanent loss or temporary disturbance of the designated feature 'chalk reef' for the Thanet Coast SAC during operation or maintenance and, therefore, there is no AEoI to the chalk reef feature of the Thanet Coast SAC in relation to permanent loss or temporary disturbance from Thanet Extension alone and therefore, subject to natural change, the chalk reef feature will be maintained in the long-term.

Thanet Coast and Sandwich Bay SPA

11.2.58 The potential for temporary disturbance will occur during O&M within the intertidal habitats, which are comprised of saltmarsh and the mudflat foreshore. These habitats are potential roosting and feeding habitats for designated bird species within the Thanet Coast and Sandwich Bay SPA.

11.2.59 No substantive maintenance is expected to be required to the intertidal cables, with maintenance expected to comprise of inspections, including geophysical investigations, involving persons on foot or using a small 4 wheel drive. The assessment during construction and decommissioning identified these habitats to generally have low sensitivity to disturbance.

- 11.2.60 Saltmarsh is common throughout Pegwell Bay and is present throughout the study area, including further south towards Sandwich Bay. Given that the intertidal habitats are common and widespread throughout the region, the area directly affected represents a very small footprint compared to their overall extent. Further, through discussion within the Evidence Plan (12th July 2017), it has been confirmed that the saltmarsh is, in areas around the proposed landfall, well established *Spartina* and as such, less diverse than the patchier *Salicornia* saltmarsh to the north, in proximity to the hoverport. Such saltmarsh is considered of lower quality and lesser importance for birds than the habitat found further north around the hoverport (Evidence Plan meeting - 26th May 2017). It is also of note that a section of the area immediately adjacent to the Country Park, and therefore the location of the proposed landfall, is above MHW and as such characterised by areas of reed and grass rather than high value saltmarsh.
- 11.2.61 As described above, the mudflat foreshore is characterised by species that show rapid recovery to disturbance.
- 11.2.62 Within the ES assessment (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)), the magnitude of the impact to the saltmarsh and foreshore has been assessed as low, with the sensitivity of the receptor assessed as medium. Therefore, the significance of the effect from the temporary disturbance of the intertidal foreshore is assessed as minor, which is not significant in EIA terms.
- 11.2.63 The conservation objectives for the SPA require maintenance of the extent and distribution, together with the structure and function of the habitats of the qualifying features. Although the operational stage of Thanet Extension will result in a small area of intertidal foreshore being temporarily disturbed during maintenance, this represents a very small proportion of the overall habitat, in an area known to be less diverse and of lower quality when compared to the areas of saltmarsh present within the wider area and consisting of mudflat foreshore characterised by species that show rapid recovery to disturbance. Combined with the conclusion of minor significance within the ES, it is considered that the potential for temporary disturbance of the intertidal foreshore which may result from maintenance activities, if required, would be short-term and temporary and would therefore not be significant in terms of the site.
- 11.2.64 There is, therefore, no AEoI to the intertidal habitats used by the designated ruddy turnstone and European golden plover features of the Thanet Coast and Sandwich Bay SPA in relation to temporary disturbance during O&M from Thanet Extension alone and therefore, subject to natural change, the designated features will be maintained in the long-term with respect to the potential for effect from temporary disturbance.

Thanet Coast and Sandwich Bay Ramsar

- 11.2.65 The potential for temporary disturbance will occur during O&M within the intertidal habitats, which are comprised of saltmarsh and the mudflat foreshore. These habitats are included as intertidal habitats for designated species within the Thanet Coast and Sandwich Bay Ramsar. The potential for an effect on ruddy turnstone is assessed above as part of the consideration of the Thanet Coast and Sandwich Bay SPA; that assessment applies equally to the ruddy turnstone feature of the Thanet Coast and Sandwich Bay Ramsar and is therefore not repeated here.
- 11.2.66 Although there are no conservation objectives for the Ramsar, the SPA does, with these considered here and referenced above. Although the operational stage of Thanet Extension will result in a small area of intertidal foreshore being temporarily disturbed during maintenance, this represents a very small proportion of the overall habitat, in an area known to be less diverse and of lower quality when compared to the areas of saltmarsh present within the wider area and consisting of mudflat foreshore characterised by species that show rapid recovery to disturbance. Combined with the conclusion of minor significance within the ES, it is considered that the potential for temporary disturbance of the intertidal foreshore which may result from maintenance activities, if required, would be short-term and temporary and would therefore not be significant in terms of the site.
- 11.2.67 There is, therefore, no AEoI to the intertidal habitats used by the designated ruddy turnstone feature of the Thanet Coast and Sandwich Bay Ramsar in relation to temporary disturbance during O&M from Thanet Extension alone and therefore, subject to natural change, the feature will be maintained in the long-term with respect to the potential for effect from temporary disturbance.

EMF

- 11.2.68 The potential for an AEoI as a result of EMF on subtidal and benthic intertidal habitats during O&M relates to the following designated site and the relevant feature (i.e. those features screened in for LSE):
- Thanet coast SAC
 - Chalk reefs
- 11.2.69 EMF are generated by the current that passes through an electric cable. It is known that EMF can be detected by fish and elasmobranchs and it is thought that benthic invertebrates can also detect EMF.

11.2.70 Project mitigation will ensure that Inter-array and export cables will be buried to a maximum target depth of 3 m, subject to a cable burial risk assessment (to be provided for within the DCO and completed in consultation with the relevant statutory authorities). Where it is not possible to bury the cables sufficiently, cable protection will be used. While cable protection or burial does not decrease the strength of EMF at source, it does increase the distance between the cables and benthic receptors, thereby reducing the received EMF (from attenuation of the EMF) and potentially reducing the effect on those receptors.

Thanet Coast SAC

11.2.71 Although a short section of the OECC falls partially within the Thanet Coast SAC (an overlap of 0.14 km², approximately 0.5% of the total SAC extent), the site specific surveys have not identified the presence of the designated chalk reef feature. Even should the OECC as installed overlap the SAC boundary (only a small amount of the RLB falls within the SAC and therefore the OECC may fall outside the SAC boundary), only a fraction of that 0.14 km² would be directly affected.

11.2.72 Given the absence of the sublittoral chalk reef feature within the footprint of the project, combined with the EMF mitigation referred to above, the OECC will not result in EMF effects in proximity to the designated chalk reef feature of the Thanet Coast SAC.

11.2.73 There will, therefore, be no potential for EMF effects on the designated feature 'chalk reef' for the Thanet Coast SAC during operation or maintenance and, therefore, there is no AEol to the chalk reef feature of the Thanet Coast SAC in relation to EMF from Thanet Extension alone and therefore, subject to natural change, the chalk reef feature will be maintained in the long-term.

Increased suspended sediment and associated deposition

11.2.74 The potential for an AEol as a result of increased SSC and associated deposition on subtidal and benthic intertidal habitats during O&M relates to the following designated sites and the relevant feature (i.e. those features screened in for LSE):

- Thanet coast SAC;
 - Chalk reefs.
- Margate and Long Sands SAC;
 - Sand banks which are slightly covered by sea water all the time.
- Thanet Coast & Sandwich Bay SPA; and
 - Intertidal habitats used by ruddy turnstone (Non-breeding); and
 - Intertidal habitats used by European golden plover (Non-breeding).
- Thanet Coast & Sandwich Bay Ramsar.

- Ramsar Criterion 6 – Intertidal habitats used by species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

11.2.75 For both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar sites, the potential for AEol relevant to intertidal habitats arises from the potential effect on intertidal habitats.

11.2.76 Minor amounts of sediment may be released into suspension, with subsequent deposition, during the O&M phase, for example should cable repairs be required or resulting from scour. However, the degree of sediment disturbance and any resulting increase in SSC and subsequent deposition will be much reduced when compared to the construction phase.

Thanet Coast SAC

11.2.77 The magnitude of the impact during construction, which will be greater than any impact during the O&M phase, has been assessed within the ES as regards subtidal ecology (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)) as low, with the maximum sensitivity of the receptors being medium. Furthermore, the post-construction surveys undertaken for TOWF identified that changes in faunal composition between pre- and post-construction were only as a result of natural variation, suggesting no long-term impacts from increased SSC or increased sediment deposition (MESL, 2013). The significance of effect from changes in SSC and associated sediment deposition occurring as a result of O&M activities will be at most the same as during cable installation activities and will therefore at most be minor, which is not significant in EIA terms.

11.2.78 Although impacts are predicted to be low, there is potential for sediment released to reach the Annex I habitat (chalk reef) qualifying feature of the Thanet Coast SAC. The Regulation 33 document for the North East Kent Coast EMS⁶⁸ (which includes the Thanet Coast SAC) finds the following in relation to the chalk reefs and siltation:

'The communities found on the reefs around Thanet are however, naturally tolerant of a degree of siltation due to the relatively high sediment load in the water column. Because of this, the reefs of the Thanet coastline are considered to be of a low sensitivity to physical damage through siltation.'

11.2.79 It is therefore considered that, given the short-term and temporary nature of any such change, the existing levels of SSC in the area, the ES conclusion of minor, the lack of AEol during construction (when potential for effect is much greater) and the known low sensitivity of the chalk reef feature to siltation, it is concluded that the sites conservation objectives will be maintained in the long-term. There is, therefore, no AEol to the chalk reef feature of the Thanet Coast SAC in relation to increased SSC and associated deposition from Thanet Extension alone during O&M and therefore, subject to natural change, the chalk reef feature will be maintained in the long-term.

Margate and Long Sands SAC

11.2.80 The magnitude of the impact during construction, which will be greater than any impact during the O&M phase, has been assessed within the ES as regards subtidal ecology (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)) as low, with the maximum sensitivity of the receptors being medium. Furthermore, the post-construction surveys undertaken for TOWF identified that changes in faunal composition between pre- and post-construction were only as a result of natural variation, suggesting no long-term impacts from increased SSC or increased sediment deposition (MESL, 2013). The significance of effect from changes in SSC and associated sediment deposition occurring as a result of O&M activities will be at most the same as during cable installation activities and will therefore at most be minor, which is not significant in EIA terms.

11.2.81 Although impacts are predicted to be low, there is potential for the sediment released to reach the Annex I habitat (sand banks which are slightly covered by sea water all the time) qualifying feature of the Margate and Long Sands SAC. The array boundary for Thanet Extension is approximately 3 km from the boundary of the SAC and therefore beyond the 560 m range for 0.05 m deposition highlighted in the ES (Volume 2, Chapter 5: Benthic Subtidal and Intertidal Ecology (Document Ref: 6.2.5)). Any short-term and temporary increase in SSC levels that reaches the SAC boundary will be reduced from the nearfield maximum, together with a reduced potential for deposition.

11.2.82 The Regulation 35 Advice on Activities for the SAC⁶⁹ considers the vulnerability of the site to non-toxic contamination, specifically an increase in turbidity, concluding a low vulnerability (vulnerability being a function of sensitivity and exposure).

11.2.83 Given the short-term and temporary nature of the effect, combined with the existing SSC levels in the region, the lack of long-term impacts found following the construction of the TOWF and the lack of AEol during construction (when potential for effect is much greater), it is concluded that the sites conservation objectives will be maintained in the long-term. There is, therefore, no AEol to the sand banks which are slightly covered by sea water all the time feature of the Margate and Long Sands SAC in relation to increased SSC and associated deposition from Thanet Extension alone during O&M and therefore, subject to natural change, the feature sand banks which are slightly covered by sea water all the time will be maintained in the long-term.

Thanet Coast and Sandwich Bay SPA

11.2.84 The species and habitats identified during the intertidal characterisation surveys (LS.LSa.FiSa, LS.LSa.MuSa.CerPo and LS.LSa.MuSa) are typical of the wider region of the surrounding area. All three biotopes have been assessed according to the MarLIN and MarESA criteria as having a high recoverability to changes in SSC, high recoverability to 'light' sediment deposition (5 cm) and a high to medium recoverability to 'heavy' sediment deposition (> 5 cm).

11.2.85 In addition, the intertidal zone of Pegwell Bay within the landfall area is an accretion zone, with sediment received from natural supplies including updrift, offshore and fluvial sources. While sands and silts are transported into Pegwell Bay on tidal currents, the majority of sediment transport occurs during storm surge events, with shingle movement, flattening of areas and berm creation in others. Therefore, the habitats identified within the landfall area will likely have a low intolerance to these impacts.

⁶⁸ <http://publications.naturalengland.org.uk/file/3229392>

⁶⁹ <http://publications.naturalengland.org.uk/file/3271272>

11.2.86 Within the ES, the magnitude of the impact during construction, which will be greater than any impact during the O&M phase, has been assessed as low, with the maximum sensitivity of the receptors being medium. Therefore, the significance of effect from changes in SSC and associated sediment deposition in the intertidal area occurring as a result of O&M activities will be at most the same as during cable installation activities and will therefore at most be minor, which is not significant in EIA terms.

11.2.87 Given the habitats are naturally accreting and increases to SSCs will be local and rapidly attenuate to natural levels, the conservation objectives for the Thanet Coast and Sandwich Bay SPA, which require the integrity of the site to be maintained or restored, by maintaining or restoring the extent and distribution of the habitats of the qualifying species and overall structure and function of the habitats, will not be compromised.

11.2.88 There is, therefore, no AEoI to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay SPA in relation to the short-term and temporary increased suspended sediments and deposition effects from Thanet Extension alone during O&M and therefore, subject to natural change, the intertidal habitats will be maintained in the long-term with respect to the potential for effect from an increase in SSC and subsequent deposition.

Thanet Coast and Sandwich Bay Ramsar

11.2.89 The potential for an increase in suspended sediment and subsequent deposition to affect the Thanet Coast and Sandwich Bay Ramsar is equal to that assessed for the SPA, with that text not repeated here, particularly given that, in the absence of conservation objectives for the Ramsar, those applied to the SPA are considered here. Given the habitats are naturally accreting and increases to SSCs will be local and rapidly attenuate to natural levels, the conservation objectives for the Thanet Coast and Sandwich Bay SPA, which require the integrity of the site to be maintained or restored, by maintaining or restoring the extent and distribution of the habitats of the qualifying species and overall structure and function of the habitats, will not be compromised.

11.2.90 There is, therefore, no AEoI to the intertidal habitats used by the designated feature of the Thanet Coast and Sandwich Bay Ramsar in relation to the short-term and temporary increased suspended sediments and deposition effects from Thanet Extension alone during O&M and therefore, subject to natural change, the intertidal habitats will be maintained in the long-term with respect to the potential for effect from an increase in SSC and subsequent deposition.

Change to physical processes

11.2.91 The potential for an AEoI as a result of a change in physical processes on subtidal and benthic intertidal habitats during O&M relates to the following designated sites and the relevant features (i.e. those features screened in for LSE):

- Thanet coast SAC;

- Chalk reefs.

- Margate and Long Sands SAC;

- Sand banks which are slightly covered by sea water all the time.

- Thanet Coast and Sandwich Bay SPA; and

- Intertidal habitats used by ruddy turnstone (Non-breeding); and

- Intertidal habitats used by European golden plover (Non-breeding).

- Thanet Coast & Sandwich Bay Ramsar.

- Ramsar Criterion 6 – Intertidal habitats used by species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

11.2.92 For both the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar sites, the potential for AEoI relevant to intertidal habitats arises from the potential effect on qualifying species.

11.2.93 In the subtidal, the presence of foundations, scour protection and cable protection material may introduce changes to the local hydrodynamic and wave regime, resulting in changes to the sediment transport pathways and associated effects on benthic ecology. Scour and increases in flow rates can change the characteristics of the sediment potentially making the habitat less suitable for some species.

11.2.94 The ES (Volume 2, Chapter 2: Marine Geology, Oceanography and Physical Processes (Document Ref: 6.2.2)) has determined that the potential for impacts on physical processes will be negligible to minor, with any such impacts being localised and of short to medium term duration.

11.2.95 The works at landfall will, depending on the final option taken forward, include one of more of: realignment of the existing sea defences, temporary cofferdam, HDD exit pits and open cut cable trenching. Volume 2 Chapter 2 Marine Geology, Oceanography and Physical Processes considers the potential for these to result in changes to hydrodynamics, sediment transport and beach morphology. The conclusion is that the magnitude of impact (if measurable) would be low and localised in extent, albeit of long-term duration, with the effect being minor which is not significant in EIA terms.

11.2.96 Any such localised and minor change in physical processes will have a negligible risk for intertidal and subtidal habitats, including the relevant features of the Thanet Coast SAC (chalk reefs), Margate and Long Sands SAC (sand banks which are slightly covered by sea water all the time) and the intertidal habitats within the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar, and the conservation objectives will therefore be maintained in the long-term. There is, therefore, no AEoI to the designated features of these sites in relation to the negligible risk of a change in physical processes from Thanet Extension alone during O&M and therefore, subject to natural change, the relevant features will be maintained in the long-term.

11.3 Marine Mammals

11.3.1 A description of the significance of project level effects upon the receptors grouped under 'marine mammals', as relevant to the designated sites and their associated features screened in for LSE, is provided below. All designated sites screened in, including the features and effects for which potential for LSE has been concluded, are summarised in Table 7.3.

Construction and Decommissioning

Increase in underwater noise (construction)

11.3.2 The following assessment is in relation to the potential for effect during construction only. The Screening Report (Annex 1, Document Ref: 5.2.1) and subsequent updates (section 7) determined that the potential for LSE in relation to underwater noise during decommissioning would be similar to and potentially less than those outlined in the construction phase. LSE resulting from underwater noise has been screened out of LSE for the O&M phase.














11.3.3 The potential for an increase in underwater noise during construction to result in an AEol relates to the following designated sites and the relevant features:

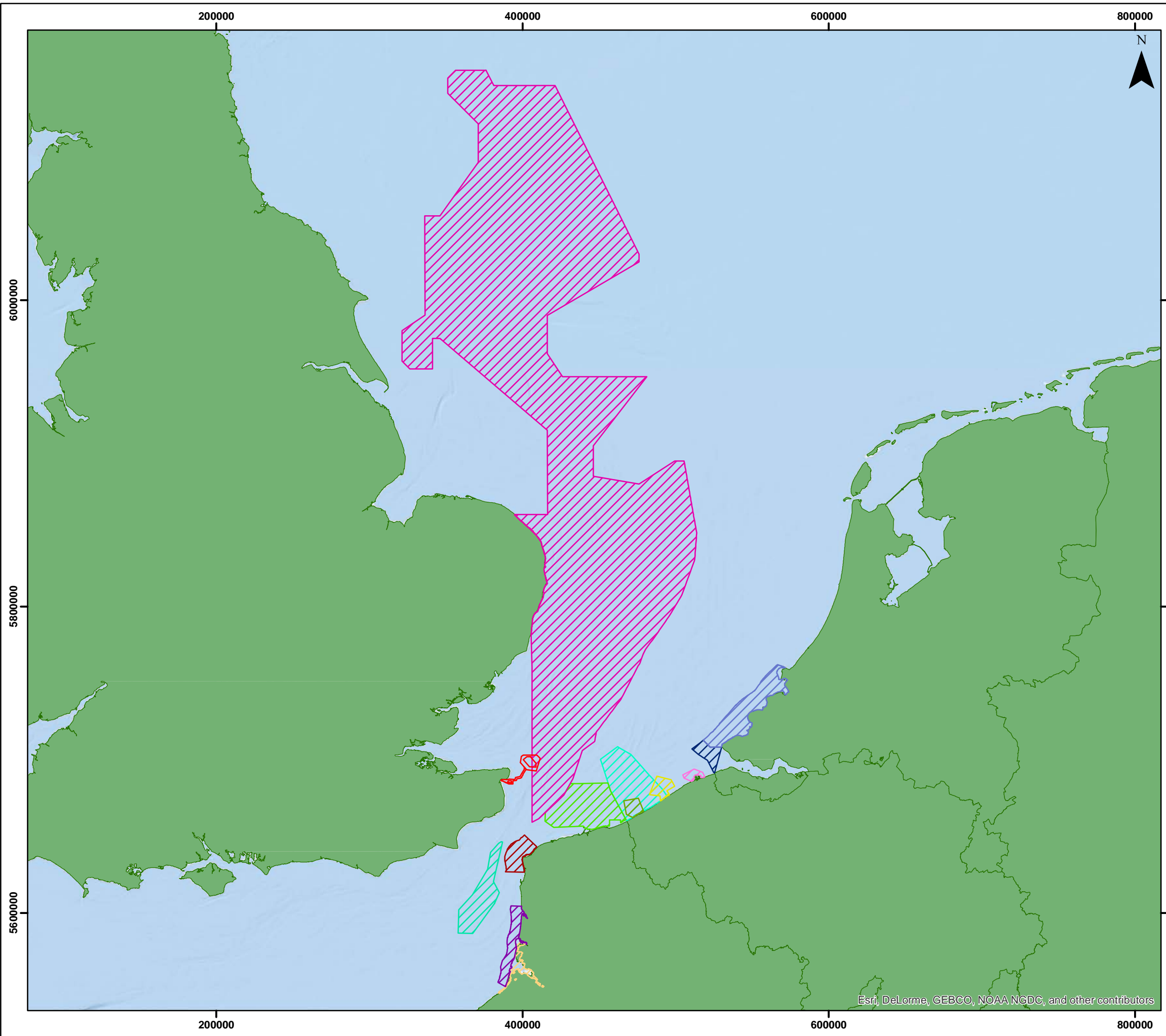
- Southern North Sea cSAC (harbour porpoise);
- Bancs de Flandres SCI (harbour porpoise, harbour seal and grey seal);
- Baie de Canche et couloir des trois estuaires (harbour seal, grey seal);
- Vlakte van de Raan (harbour seal, grey seal);
- Voordelta (harbour seal, grey seal);
- Estuaires et littoral picards (baies de Somme et d'Authie) (harbour seal, grey seal);
- Recifs Gris-Nez Blanc-Nez (harbour seal, grey seal);
- Vlaamse Banken (harbour seal, grey seal);
- SBZ 1 (grey seal);
- SBZ 2 (grey seal);
- SBZ 3 (grey seal); and
- Ridens et dunes hydrauliques (grey seal and harbour seal).

11.3.4 The location of these designated sites, in relation to Thanet Extension, is shown in Figure 11.1.

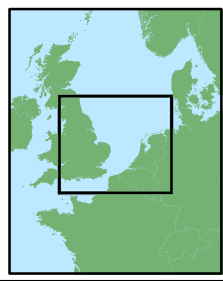
THANET EXTENSION OFFSHORE WIND FARM

Figure 11.1
Sites Identified for Marine Mammals in Relation to Thanet Extension

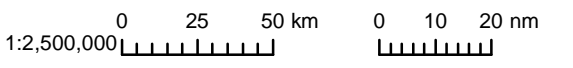
- Legend**
-  Offshore Red Line Boundary
 - Identified Designated Sites
 -  Baie de Canche et couloir des trois estuaires
 -  Bancs des Flandres
 -  Estuaires et littoral picards (baies de Somme et d'Authie)
 -  Ridens et dunes hydrauliques du détroit du Pas-de-Calais
 -  Récifs Gris-Nez Blanc-Nez
 -  SBZ 1 / ZPS 1
 -  SBZ 2 / ZPS 2
 -  SBZ 3 / ZPS 3
 -  Southern North Sea
 -  Vlaamse Banken
 -  Vlakte van de Raan
 -  Voordelta



Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig11.1_MarineMammalsSites			Figure 11.1
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By	RM	Layout	N/A	

11.3.5 There are a number of sources of underwater noise associated with the project alone during construction, with these identified within Volume 2, Chapter 7: Marine Mammal (Document Ref: 6.2.7):

- Clearance of unexploded ordnance (UXO);
- Pile-driving during the installation of foundations for WTGs, OSS (if required) and met mast (if required);
- Vessel activity; and
- Seabed preparation for both WTG, OSS, met mast and cable installation (e.g. dredging) and other activities in relation to cable installation (such as rock dumping and trenching).

11.3.6 In addition to these, should they be required by the project, there is potential for underwater sound to be generated during geophysical or seismic survey and should Acoustic Deterrent Devices (ADDs) be used as mitigation.

11.3.7 The importance of underwater noise for marine mammals (including harbour porpoise, harbour seal and grey seal) is discussed in Volume 2, Chapter 7: Marine Mammal (Document Ref: 6.2.7). That information, together with the underwater noise that may result from the above activities (as discussed in Volume 4, Annex 6-3: Underwater Noise (Document Ref: 6.4.6.3)) and how that may affect marine mammals in the context of the conservation objectives for each relevant designated site, is drawn on here, with each of these effects discussed in turn below, including the relevance for the relevant features identified.

UXO Clearance

11.3.8 Experience from other OWF projects in the southern North Sea, together with the experience of the Nemo interconnector project, suggests that there is the potential for UXO to occur within the array and OECC for Thanet Extension and that it is likely that UXO clearance work may be required in some cases; this would need to be confirmed by site specific surveys. It should be noted that the preferred action for VWPL is for no UXO clearance to occur; however, should UXO be detected during the pre-construction geophysical survey, clearance (including a detonation option) may be required prior to construction as a safety measure. Any required UXO clearance would take place before construction piling commences, with the proposed date for such clearance being from 2019 (but more likely to be 2020). UXO clearance will not occur on the same day but could occur within the same season as piling or geophysical survey at Thanet Extension.

11.3.9 It is not possible at this stage to accurately predict the number of UXO that would require clearance. Experience suggests that the number of targets encountered can be significant, but that the number which prove positive and actually require detonation is limited. Experience from other offshore wind projects within the southern North Sea suggests that, on average, around 20 *in situ* detonations may be expected – however, a precautionary assumption of 30 is being made here. UXO clearance is expected to occur during daylight hours only, with the potential for multiple clearances to occur within a day (provided relevant thresholds are not exceeded), thus limiting the overall duration of the work. It is anticipated that up to 8 detonations could occur within a single 24 hour period, with approximately 7.5 days of work in total (based on an average of 4 clearances per day).

11.3.10 The potential for impact would therefore be expected to relate to a series of up to 30 controlled explosions across the project area and OECC, resulting in a series of discrete, single sources of underwater noise. As noted above, the location(s) of any such UXO have yet to be identified; the final location of any UXO requiring clearance will influence the potential for disturbance within a designated site, notably for harbour porpoise where a 26 km EDR is relevant. The consideration here draws on Volume 2 Chapter 7: Marine Mammals of the ES, which includes consideration of underwater noise modelling for UXO (applying the 2016 NOAA thresholds).

- 11.3.11 UXO clearance for UXO up to 130 kg (if required) would be included within a Marine Licence and/ or with an EPS Licence application to follow as required. It is standard practice for a condition to be attached to any such licences requiring a UXO-MMMP to be in place as part of the required mitigation, to ensure that the risk of lethal and injurious effects is kept as low as feasible, with the works meeting the required EPS tests⁷⁰. Furthermore, it should be noted that in the JNCC guidance for minimising the risk of injury to marine mammals from explosives⁷¹, that mitigation measures implemented through a UXO-MMMP are focused on the prevention of injury rather than disturbance. For activities that make use of explosions for a relatively short period of time (such as clearance of UXO), the JNCC guidance notes that there is a low likelihood of disturbance occurring that could be sufficient to lead to an offence. From this, it can be seen that the UXO-MMMP that would be required (and agreed with SNCBs) would provide mitigation to ensure that the risk of injury is as low as possible, meeting the requirements of EPS licensing (namely the three tests – IROPI, alternatives and FCS), with the risk of disturbance considered to be extremely low.
- 11.3.12 The UXO-MMMP will ensure that an appropriately sized mitigation zone is applied around each location (where *in situ* explosion is required) together with appropriate detection and/ or deterrent measures if required (in line with the JNCC, 2010 guidance together with more recent advice and best practice). The mitigation will minimise the risk that marine mammals (including harbour porpoise, harbour seal and grey seal) would be within the zone of potential lethal and injurious effects (noting that PTS is defined as an injury), and prior to detonations being carried out. The EDR for UXO is 26km, with Thanet Extension being at least 229 km distant from the summer extents of the SNS cSAC – and therefore any UXO clearances conducted within the summer season would not be screened in for consideration within the RIAA. The draft UXO-MMMP, if required, will be developed in consultation with the statutory advisors together with the associated EPS Licence application should the need for UXO clearance arise.
- 11.3.13 It should be noted that Volume 2, Chapter 7: Marine Mammal (Document Ref: 6.2.7) specifically considered the risk of PTS in marine mammals as a result of UXO clearance, finding that based on the onset range for PTS (unweighted) approximately 11 harbour porpoise could potentially be at risk of PTS (less than 0.01% of the reference population) and less than one individual harbour or grey seal. The assessment noted significant uncertainty in the models and the likelihood that the numbers were overestimates. The level of effect was found to be minor and therefore not significant.

Consideration of Harbour Porpoise for RIAA Purposes

- 11.3.14 Given that the proposed MMMP (Document Ref: 8.11) will provide for appropriate mitigation to minimise the risk of injury or mortality in harbour porpoise during percussive piling, and that a UXO-MMMP would be implemented (with prior approval by the regulator) for the same purpose prior to any UXO clearance, it is concluded that Thanet Extension alone does not have an AEoI on the viability of harbour porpoise as a result of mortality or injury resulting from UXO clearance within the designated sites identified above (including the SNS cSAC and Bancs de Flandres SCI) and therefore ensures that, subject to natural change, harbour porpoise will be maintained as a 'viable component' of the sites in the long-term with respect to the potential for mortality and injury.
- 11.3.15 With respect to the second harbour porpoise conservation objective, the requirement is to determine the potential for significant disturbance within the SNS cSAC and the Bancs de Flandres SCI.
- 11.3.16 For harbour porpoise, an EDR of 26 km can be applied when considering the potential for disturbance from an individual UXO clearance. Since the array boundary is approximately 229 km from the summer extents of the SNS cSAC, any UXO detonation occurring during the summer season would not have any effect on that conservation objective. For any UXO clearance within the winter season, the maximum overlap per individual UXO clearance with the SNS cSAC would be 1,308 km² (10.31% of the winter component) (see Figure 11.2). As a worst-case (assuming multiple detonations within 24 hours, with up to 8 per day, within a 7.5 day window, to a maximum of 30), the maximum possible overlap in a single 24 hour period would be 1,503 km² (11.85% of the winter component). The calculation is based on a worst possible case, which would only arise should three detonations occur at the edge of the array and one at the edge of the OECC (four detonations in total). No other combination (in terms of number or locations) of detonations within a single 24 hour period could result in a larger spatial effect and therefore the 20% threshold within a single day will not be exceeded (even if multiple UXO clearances were to occur within a single 24 hour period and within the winter season).

⁷⁰ <http://publications.naturalengland.org.uk/file/8499055>

⁷¹ http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Explosives%20Guidelines_August%202010.pdf

11.3.17 For the transboundary site, the maximum area of overlap for the Bancs de Flandres SCI would be 43 km² (3.34% of the SCI). Further, it is clear from Figure 11.2 that UXO clearance would need to occur within a small proportion of Thanet Extension array boundary to result in such spatial overlap. As for the SNS cSAC, the 20% threshold within a single day would not be exceeded.

11.3.18 The anticipated duration of UXO clearance would take an estimated 7.5 days (provided 30 detonations are required and assuming four detonations per day, up to a maximum of eight per day). For assessment purposes, as a temporal worst-case, it could be assumed that the slowest rate of detonations would require 30 days (i.e. one per day). For the 10% averaged across a season, although there is potential for 10% within a single day to be exceeded, the effect would be for a very short duration (days to weeks). For the SNS cSAC (for which the seasonal effect would be greater than Bancs de Flandres), and assuming a single clearance per day for 30 days of the winter season, the seasonally averaged value is 1.70%. The value decreases significantly should the faster rate of clearance be applied (assuming four clearances per day, taking 7.5 days), being 0.52%. Therefore, when averaged across six months, the anticipated level of UXO clearance would not exceed the 10% threshold for either the SNS cSAC or the Bancs de Flandres SCI. It is also apparent that if required (and taking account of in-combination effects) there would be capacity for additional UXO clearances to occur and for the 20% daily and 10% seasonal thresholds to be met.

11.3.19 Therefore, it is concluded with confidence that there will not be an AEoI in relation to disturbance on the Conservation Objective for harbour porpoise for the SNS cSAC or the Bancs de Flandres SCI as a result of UXO clearance from Thanet Extension alone and therefore, subject to natural change, in the long-term, there will be no significant disturbance of harbour porpoise.

Table 11.1: Spatial Extent of Disturbance associated with UXO Clearance within the Designated Sites

Designated Site	Potential Effect from UXO Clearance	
	Area of effect (km ²)	% of site (winter seasonal component)
Single UXO Clearance		
SNS cSAC	Max: 1,308 km ²	Max: 10.31% (winter extents)
	Min: 119 km ²	Min: 0.94% (winter extents)
Bancs de Flandres SCI	Max: 43 km ²	Max: 3.34% (total SCI)
	Min: 0 km ²	Min: 0% (total SCI)
Maximum UXO clearance in 24 hours*		
SNS cSAC	Max: 1,503 km ²	Max: 11.85% (winter extents)
Bancs de Flandres SCI	Max: 43 km ²	Max: 3.34% (total SCI)

* 4 UXO clearances within 24 hours would represent the worst-case in terms of spatial extent, with no other number or location combinations of UXO clearances resulting in a larger spatial extent of effect

11.3.20 The third conservation objective is focused on maintaining the availability and density of suitable harbour porpoise prey within the cSAC and SCI. For harbour porpoise, as noted in section 9, the habitat of the prey referred to is in relation to the characteristics of the seabed and water column, in terms of, for example stable stratified waters, current speed, the particle size of the sediment etc. There is no evidence of a pathway to link underwater noise to the seabed and water column characteristics referred to in the Conservation Objective. Even if such a pathway were to exist, the potential for Thanet Extension as a whole to affect the seabed and water column in terms of the water depth and water column variables referred to in the description of the sites Conservation Objectives has been assessed within the relevant chapters of the Thanet Extension ES application (Volume 2, Chapter 2, Document Ref. 6.2.2), with the conclusions for all potential impacts throughout the chapter being not significant.





11.3.21 There is, therefore, no AEoI to the supporting habitats and processes relevant to harbour porpoise and their prey for the SNS cSAC or the Bancs de Flandres SCI from Thanet Extension alone and therefore, subject to natural change, the availability and density of suitable harbour porpoise prey will be maintained in the long-term.

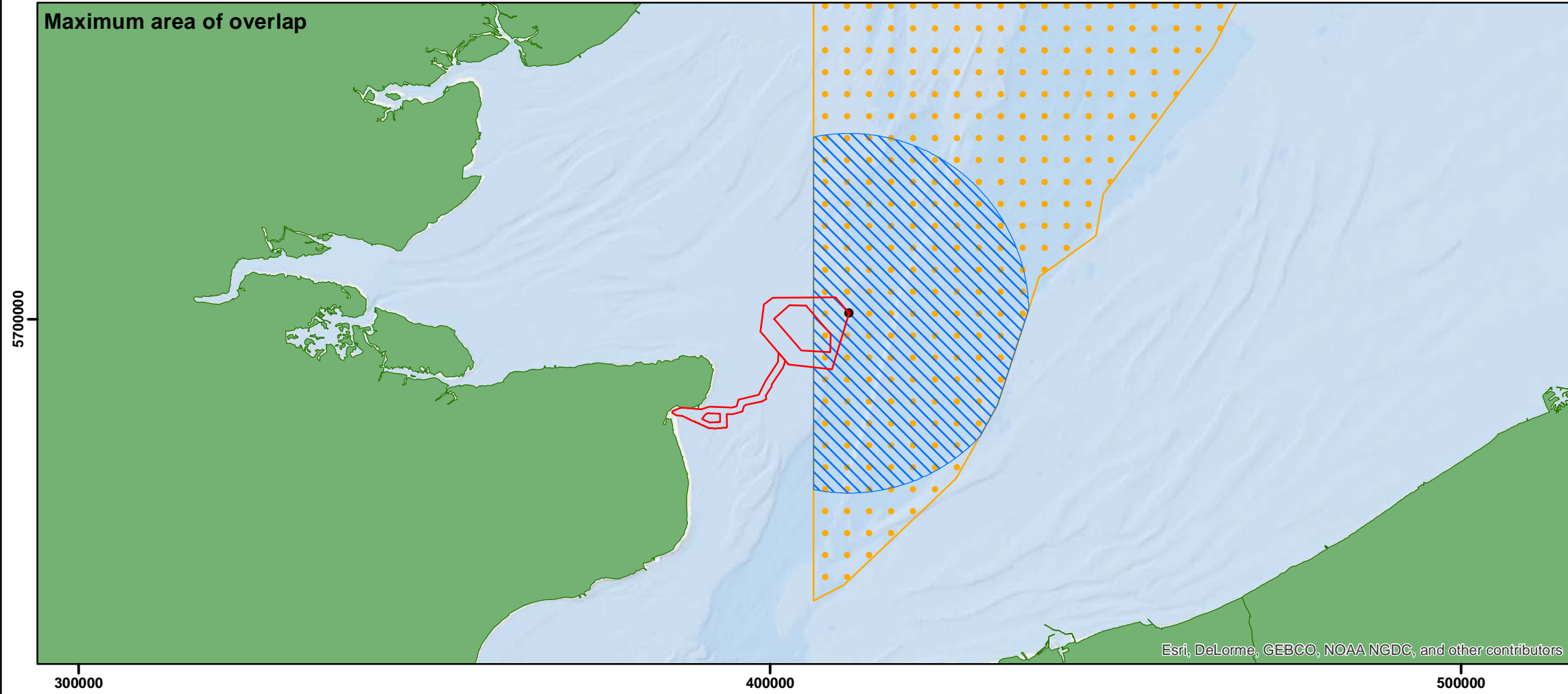
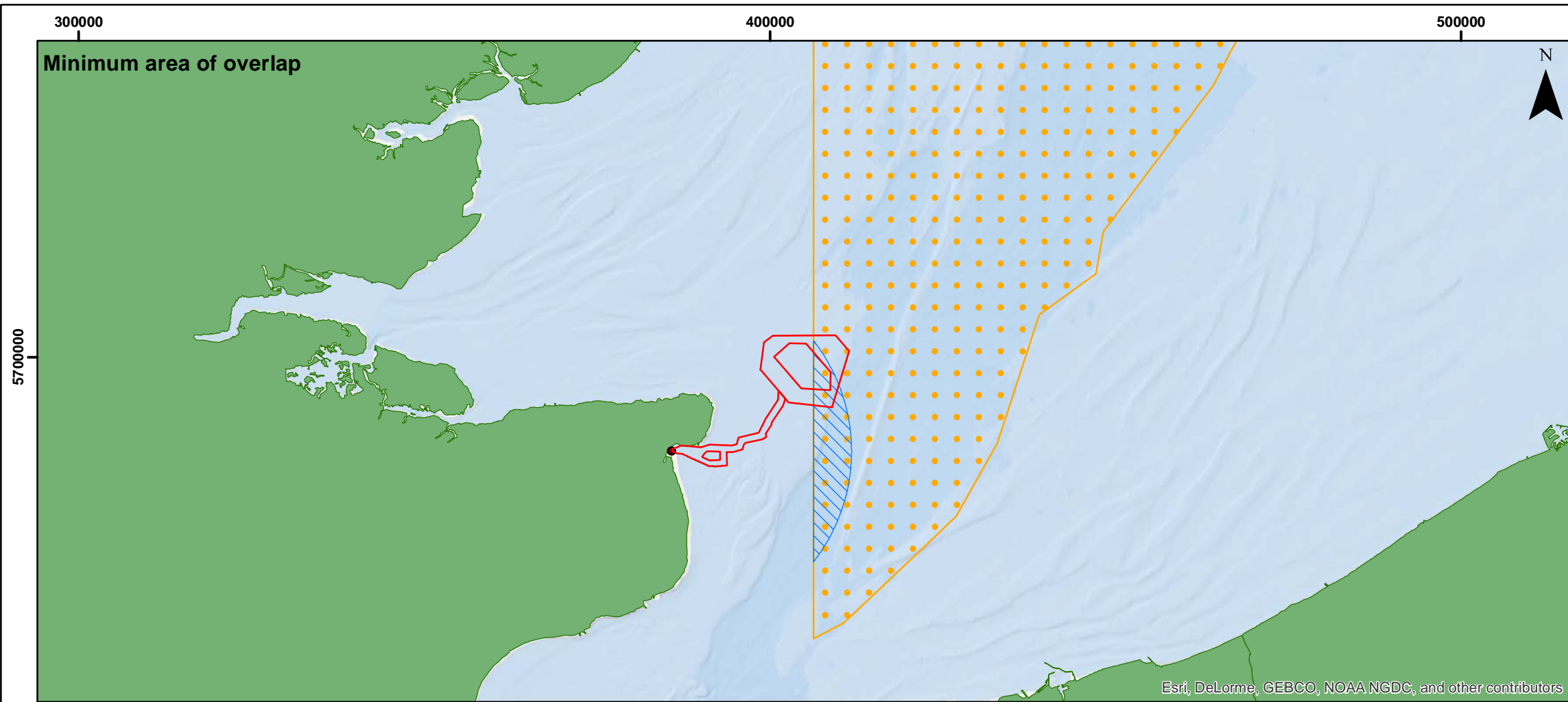
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Figure 11.2

Maximum and Minimum Areas of Overlap with the SNS cSAC as a Result of UXO Detonation

Legend

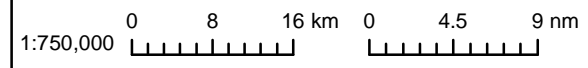
-  Southern North Sea cSAC
-  Offshore Red Line Boundary
-  UXO Detonation
-  Area of Overlap from a Single UXO Detonation



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Projection: UTM31N



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By	RM	Layout	N/A	






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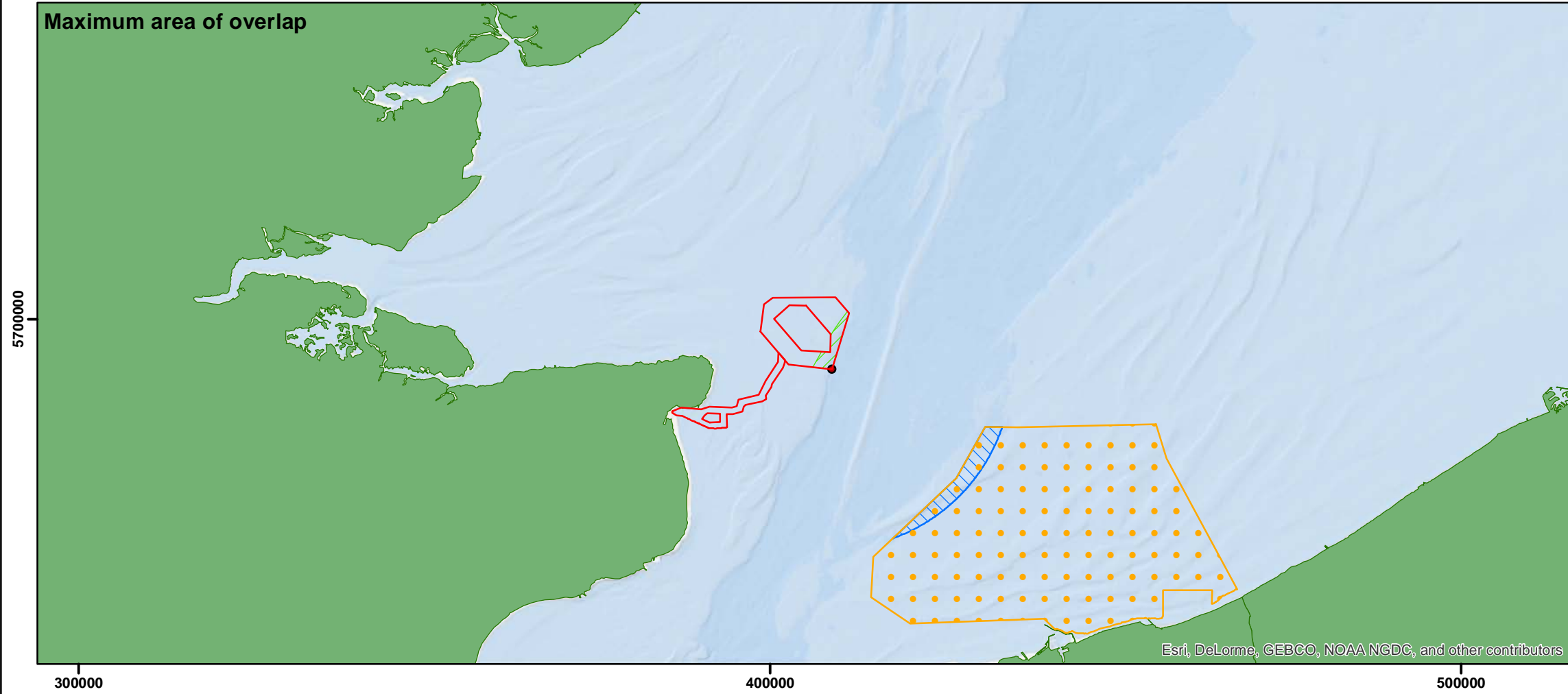
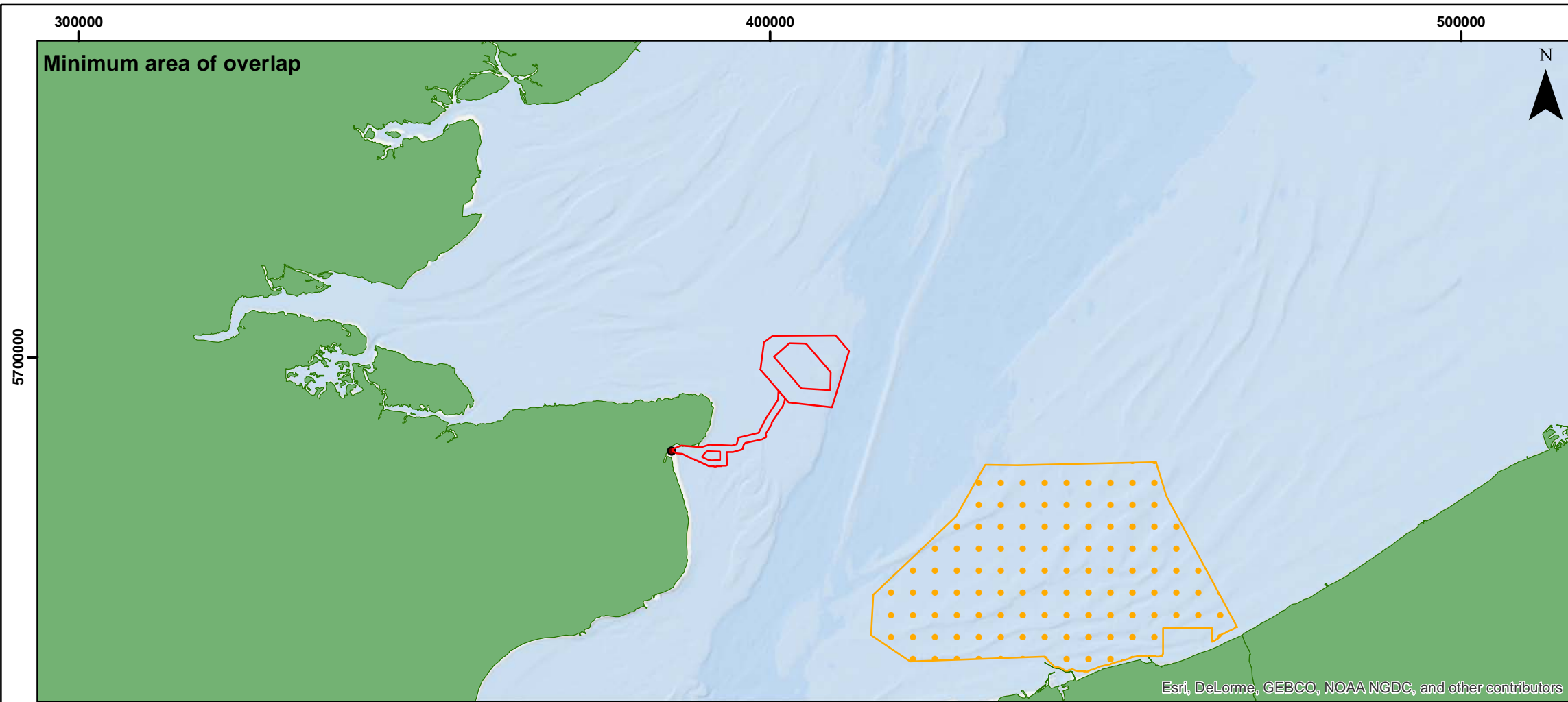
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THANET EXTENSION OFFSHORE WIND FARM

Figure 11.3
Maximum and Minimum Areas
of Overlap with the Bancs de
Flandres SCI as a Result of a
Single UXO Detonation

Legend

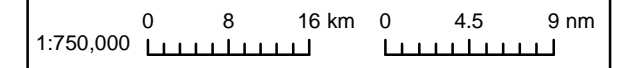
-  Offshore Red Line Boundary
-  Bancs de Flandres SCI
-  UXO Detonation
-  Area of Overlap with the Bancs de Flandres SCI
-  Area of overlap between Development Boundary and a 26 km buffer from the Bancs de Flandres SCI - Only UXO detonation within this area would result in an effect



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Consideration of Harbour Seal and Grey Seal for RIAA Purposes

- 11.3.22 The conservation status for harbour seal and grey seals requires that the species will be 'maintaining itself on a long-term basis as a viable component of its natural habitat'. As for harbour porpoise above, the implementation of a UXO-MMMP, if required, would minimise the risk of injury or mortality in harbour seal and grey seal, and therefore ensure that the viability of the species associated with the transboundary designated sites identified above as a result of mortality or injury will be maintained. As such, the population dynamics of the species will not be affected on a long-term basis and the conservation status will not be affected.
- 11.3.23 Therefore, it is concluded with confidence that there will not be an AEoI on the conservation status of harbour seal and grey seal in relation to viability as a result of UXO clearance from Thanet Extension alone and therefore ensure that, subject to natural change, in the long-term, the viability of harbour seal and grey seal will be maintained with respect to injury and mortality.
- 11.3.24 For harbour seals and grey seals, the second requirement for FCS is for 'the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future', a requirement analogous to the significant disturbance requirement for harbour porpoise. Therefore, for harbour seal and grey seal associated with transboundary sites (located between 23 km and 117 km from Thanet Extension), it is reasonable to consider the extent and duration of potential disturbance in terms of the overall available habitat. Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7) identifies the study area for seals in section 7.4, for harbour seals being the South-east England MU (IAMMWG 2013) and for grey seals the South-east England, North-east England and Scottish east coast MUs (IAMMWG 2013).
- 11.3.25 For harbour seal and grey seal, the pertinent points are the distance between Thanet Extension and each transboundary site, the overall extent of available habitat and the short-term and temporary nature of the UXO clearance. These combine to enable a conclusion that the natural range of the species as a result of UXO clearance at Thanet Extension will not be reduced for the foreseeable future.
- 11.3.26 Therefore, it is concluded with confidence that there will not be an AEoI in relation to disturbance on the conservation status for harbour seal and grey seal as a result of UXO clearance from Thanet Extension alone and therefore ensure that, subject to natural change, in the long-term, there will be no significant disturbance of harbour seal or grey seal.
- 11.3.27 For harbour seal and grey seal, the third measure of conservation status relates to there being a sufficiently large habitat to maintain the population on a long-term basis. The UXO clearance will be short-term and temporary, within a very small proportion of the overall available habitat. The extent of physical habitat available will not be affected and therefore the conservation status will similarly remain unaffected.

- 11.3.28 There is, therefore, no AEoI on the extent of harbour seal and grey seal habitat from Thanet Extension alone and therefore, subject to natural change, the extent of harbour seal and grey seal habitat will be maintained in the long-term.

Percussive piling

- 11.3.29 The maximum adverse scenario for marine mammals (Table 12.1: In-combination projects and maximum design scenario) included percussive piling during the installation of the foundation structures, for WTGs, the OSS (if required) and the met mast (if required). There will be a maximum number of 36 foundations in total (34 WTGs, 1 OSS and 1 met mast). Should these be installed on monopiles, they would require a single pile per foundation. The duration of piling per monopile is an anticipated maximum of six hours (including 60 minutes of soft start together with set up time), resulting in total anticipated piling time of 216 hours or nine days, spread across an overall piling window of six months. Should each foundation be installed on quadropod jacket foundations, the duration of piling per foundation would necessarily increase, since up to four piles would be required per foundation. The result would be an anticipated maximum piling time of eight hours per foundation, with an anticipated maximum piling time of 288 hours or approximately twelve days, spread across an overall piling window of six months.
- 11.3.30 Project specific mitigation specifically included for pile driving is identified in Table 6.1 and includes the following:
- Marine Mammal Mitigation Plan – following the 2010 JNCC guidelines, a MMMP will be produced and followed to cover the construction phase, including measures deemed necessary to reduce to negligible the potential risk of injury or death to marine mammals in close proximity to piling operations; and
 - Soft start – an hour of soft start piling during which the hammer energy will gradually be ramped up to full power applied to all piling activities.
- 11.3.31 In addition, there is the potential for Acoustic Deterrent Devices (ADDs), together with Marine Mammal Observers (MMOb) and Passive Acoustic Monitoring (PAM), to be included as mitigation within the MMMP.
- 11.3.32 Underwater noise during construction of Thanet Extension has been studied specifically through the following, including that of direct relevance to marine mammals:
- Volume 4, Annex 6-3: Underwater noise assessment (Document Ref: 6.4.6.3); and
 - Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7).

11.3.33 The 2017 Subacoustech report provides the technical evidence base for underwater noise, with the ES chapter providing the context for marine mammals (specifically harbour porpoise, harbour seal and grey seal), in relation to the potential for lethal and physical injury. Auditory injury is addressed in the ES through consideration of Permanent Threshold Shift (PTS). The threshold values applied for PTS are as follows (with the background to the various thresholds provided in section 7.11 of Volume 2, Chapter 7: Marine Mammals (Document Ref 6.2.7) of the ES):

Table 11.2: Threshold values for determining PTS impact ranges for marine mammal impact assessment (NMFS, 2016)

	National Marine Fisheries Service (2016) [#]	
	SPL _{z-p(flat)} (dB re 1 μPa)	SEL _(HG) (dB re 1 μPa ² s)
HF Cetacean (harbour porpoise)	202	155
Pinnipeds (harbour and grey seal)	218	185

Metrics are unweighted or flat weighted (flat), M weighted according to National Marine Fisheries Service (2016)(HG) with regard to the species' hearing group.

[#] Typically referred to as the 'NOAA threshold'

11.3.34 The noise modelling for lethal and non-auditory impact range during piling of monopile foundations (assuming 100% blow energy of the 5,000 kJ hammer) was undertaken at an easterly and south west location within the array, with the impact range for marine mammals for lethal injury being 3 – 4 m. For a non-auditory injury, the impact ranges increased slightly to a maximum of 53 m, with the ES finding that:

'As a result of the establishment of mitigation zones through the MMMP, as well as the amount of pre-piling vessel activity, there should be no marine mammals within a few metres of the pile. Therefore, there is no potential for any [lethal or non-auditory injury] effect'

11.3.35 The assessment within the ES presents the information on PTS (i.e. auditory injury) in both harbour porpoise and for seals, providing the information both as 'instantaneous' PTS, but also as a cumulative PTS, the latter calculated to take account of prolonged exposure over the whole piling event. The ES found that for instantaneous PTS, the modelled impact ranges in both harbour porpoise (up to 660 m (monopile) or 450 m (pin pile) at full hammer energy) and seals (up to 70 m (monopile) or 48m (pin pile) at full hammer energy). It is therefore apparent that there is an extremely low risk of an instantaneous PTS in any harbour porpoise or seal beyond 700m.

11.3.36 Despite significant uncertainty associated with a cumulative exposure estimate, potential impact ranges have been calculated within the ES, being up to just 30 m for seals (monopiles and pin piles) and up to 960 m for harbour porpoise (the latter relating to pin piles only – for monopiles, the range was significantly less at 60 m). The potential for exposure to noise levels that could cause PTS over the whole piling sequence can therefore be reduced by ensuring the mitigation zone extends out to the maximum range (across all species) predicted, namely 960 m, bearing in mind that such a level would apply to pin piles only.

11.3.37 The ES considers disturbance in harbour porpoise and seals through two assessment methods. These are a fixed threshold assessment and a dose response assessment. Full details on these methods are provided in the ES (Section 7.11, Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.7.2)), but effectively the fixed threshold method assumes a fixed area of effect and a fixed population density throughout that area, whereas the dose response applies a known rate of reduction in harbour porpoise density with distance, together with the change in sound over that distance. The ranges calculated for harbour porpoise for the fixed threshold assessment are 16.8 - 28.4 km, with these ranges (based on mean population density estimates obtained from SCANS III72) equating to between 0.17% and 0.47% of the reference population. The value compares favourably to that concluded from the harbour porpoise dose response analysis, namely 0.23 - 0.54% of the same reference population. It should be noted that the measure of possible avoidance applied in the ES (namely possible avoidance or an 'aversive behavioural reaction' and not necessarily displacement) is stronger than that represented by the EDR of 26 km, which is a measure of overall habitat loss.

11.3.38 The ES concluded the following for the dose response analysis disturbance (displacement) in harbour porpoise:

*'the effects are considered to be temporary and reversible, affecting only a small proportion of the relevant MUs, and the magnitude of the impact is assessed as low. Given that harbour porpoises have a **medium** sensitivity to the impact of potential avoidance this results in a **minor significance**, which is **not significant** in EIA terms.'*

11.3.39 For seals, a dose response analysis has been applied for behaviour. This results in a prediction of between 5.2 and 15.8 harbour seals and between 3.0 and 6.1 grey seals potentially experiencing noise levels high enough to elicit a behavioural response. This equates to between 0.07% and 0.22% of the reference population for harbour seals and between 0.01 and 0.02% of the UK reference population for grey seals.

11.3.40 The ES concluded the following for the behavioural dose response analysis in seals:

'the effects are considered to be temporary and reversible, affecting only a small proportion of the relevant management units, and the magnitude of this impact is assessed as low. Given that harbour have a medium sensitivity and grey seals have a low sensitivity to the effect of potential avoidance this results in a minor significance, which is not significant in EIA terms.'

Consideration of Harbour Porpoise for RIAA Purposes

11.3.41 To determine the potential for AEoI with respect to harbour porpoise (within both the SNS cSAC and the more distant Bancs de Flandres SCI), the first conservation objective to test is that 'the species is a viable component of the site'. The intent of this Conservation Objective is to minimise the risk posed by activities to species viability.

11.3.42 The status of harbour porpoise as a EPS is referred to within the SNS cSAC literature, in relation to defining the viability of the species. The listing of harbour porpoise under Annex IV of the Habitats Directive, means that the species is protected from deliberate killing (or injury), capture and disturbance throughout its range; in essence, the requirements for EPS protection broadly mirror those for consideration of viability (with the exception of 'capture', which does not apply to offshore wind, and without the non-deliberate element, which is included within Article 12 (4) of the Habitats Directive).

11.3.43 Initial consideration of harbour porpoise, as an EPS, is given within the Marine Mammal chapter of the ES, in the context of the general discussion of the potential for impact. The ES identified that if the risk of injury or significant disturbance cannot be reduced to negligible levels with mitigation, then an EPS licence is required.

11.3.44 The above project literature is drawn on here to demonstrate the potential for viability in harbour porpoise to be affected as a result of the underwater noise generated during percussive piling. The assessment is relevant primarily for the SNS cSAC, given the proximity of Thanet Extension to the SNS cSAC (being partially within), but also the Bancs de Flandres SCI, with the logical expectation that any potential for AEoI on that more distant site would be less than at the SNS cSAC.

⁷² <https://synergy.st-andrews.ac.uk/scans3/>

- 11.3.45 The conclusions of the ES referred to above regarding the potential spatial extent of lethal, non-auditory impact and PTS (all being within the proposed mitigation zone of 960 m) found that the proposed MMMP (Document Ref: 8.11) (as provided for in the DCO as part of the standard dML requirements and following consultation and approval with relevant statutory authorities) will provide for appropriate mitigation to minimise to negligible the risk of injury or mortality in harbour porpoise during percussive piling.
- 11.3.46 Following the implementation of the MMMP, it is concluded that Thanet Extension alone does not have an AEoI on the viability of harbour porpoise as a result of mortality or injury within the SNS cSAC and therefore cannot have an AEoI on the more distant Bancs de Flandres SCI. It can therefore be concluded that, subject to natural change, harbour porpoise will be maintained as a 'viable component' of the sites in the long-term with respect to the potential for mortality and injury. The disturbance aspect of viability is discussed below, as part of the second conservation objective.
- 11.3.47 The second conservation objective in relation to the SNS cSAC and the Bancs de Flandres SCI relates to significant disturbance within the site(s), the aim being to ensure that any resulting displacement is not significant in terms of extent and duration. The worst-case consequence of such disturbance is that harbour porpoise may be displaced from the area affected, essentially preventing access to an area of designated habitat during periods of such noisy activity.
- 11.3.48 Thanet Extension has undertaken detailed underwater noise modelling to support the characterisation of disturbance to harbour porpoise features in response to exposure to underwater piling activity (as presented in section 7.11 of Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7) of the ES). The conclusion of the ES assessment for a behavioural response to underwater noise during construction as a result of Thanet Extension alone is a determination of minor adverse significance, which is not significant in EIA terms.
- 11.3.49 As identified above, unless project specific evidence indicates otherwise, and rather than revert to individual Projects' noise modelling predictions made within respective Environmental Statements, the SNCBs have advised that a more uniform, generic approach, based on observed harbour porpoise behavioural evidence, be adopted for the disturbance assumptions when characterising significant disturbance effects (i.e., displacement) of the harbour porpoise cSAC feature, specifically the 26 km EDR.
- 11.3.50 The result of applying the EDR is to understand the potential temporary habitat loss as a result of displacement around each individual foundation location. If all the footprint fell inside the SNS cSAC, this would equate to approximately 2,124 km² (essentially the area within a circle with a radius of 26 km). The actual area of displacement at each foundation will (assuming the range is applied equally in all directions) depend on the location of that foundation relative to the cSAC boundary but also the season within which piling occurs. For example, given the location of Thanet Extension array area (being only partially within the SNS cSAC and being at least 23 km from the Bancs de Flandres SCI), some of the effect radius will fall outside the cSAC/ SCI boundary (or for the SNS cSAC the relevant seasonal component), resulting in a maximum possible displacement extent per foundation that for Thanet Extension will always be less than the potential maximum.
- 11.3.51 For the purposes of the assessment, the OSS and met mast (if required) have been considered to be additional foundations. Should piling occur at more than one foundation location within a single 24 hour period (although piling will be limited to that undertaken by a single piling rig), the potential for effect will be considered conservatively in that the footprint of disturbance within that 24 hour period would be the combined footprint from each foundation location (based on the EDR), excluding any area of overlap (to avoid double counting) and excluding consideration of any temporal delay.
- 11.3.52 The point at which a given level of possible displacement is considered significant in relation to the Conservation Objective (regardless of the noise source that leads to the displacement and as expressed in terms of area affected (in km²)), has also been determined and agreed with SNCBs. The established threshold seeks to ensure 80% availability of habitat at any one time (defined as a 24 hour period) and 90% availability of habitat on average over the season (relevant to summer and winter components of the cSAC). Therefore, for an AEoI to occur within the SNS cSAC, displacement of harbour porpoise would need to exceed 20% of the seasonal component of the cSAC at any one time (i.e. within any one 24 hour period), and/ or on average exceed 10% of the seasonal component of the cSAC over the duration of that season. For the Bancs de Flandres SCI, the determination has been applied to the whole site (there is no known seasonal differentiation across the site).
- 11.3.53 Table 11.3 below summarises the maximum and minimum area of overlap that could occur by the EDR as a result of piling at Thanet Extension at the SNS cSAC and Bancs de Flanders SCI respectively (in both km² and %). It should be noted that for the SNS cSAC, the minimum distance between the array boundary and the summer seasonal component is 229 km – therefore, for operations within the summer season, there can be no spatial effect within the cSAC. The information for the SNS cSAC is presented in relation to the winter period only.

Table 11.3: Spatial Extent of Disturbance within the Designated Sites





Designated Site	Potential Effect from Percussive piling	
	Area of effect (km ²)	% of site/ winter seasonal component
Single foundation location in a 24 hour period		
SNS cSAC	Max: 1,308 km ² Min: 669 km ²	Max: 10.31% (winter extents) Min: 5.27% (winter extents)
Bancs de Flandres SCI	Max: 43 km ² Min: 0 km ²	Max: 3.34% (total SCI) Min: 0% (total SCI)
Maximum foundation locations in a 24 hour period*		
SNS cSAC	Max: 1,485 km ² Min: 725 km ²	Max: 11.71% (winter extents) Min: 5.74% (winter extents)
Bancs de Flandres SCI	Max: 43 km ² Min: 0 km ²	Max: 3.34% (total SCI) Min: 0% (total SCI)

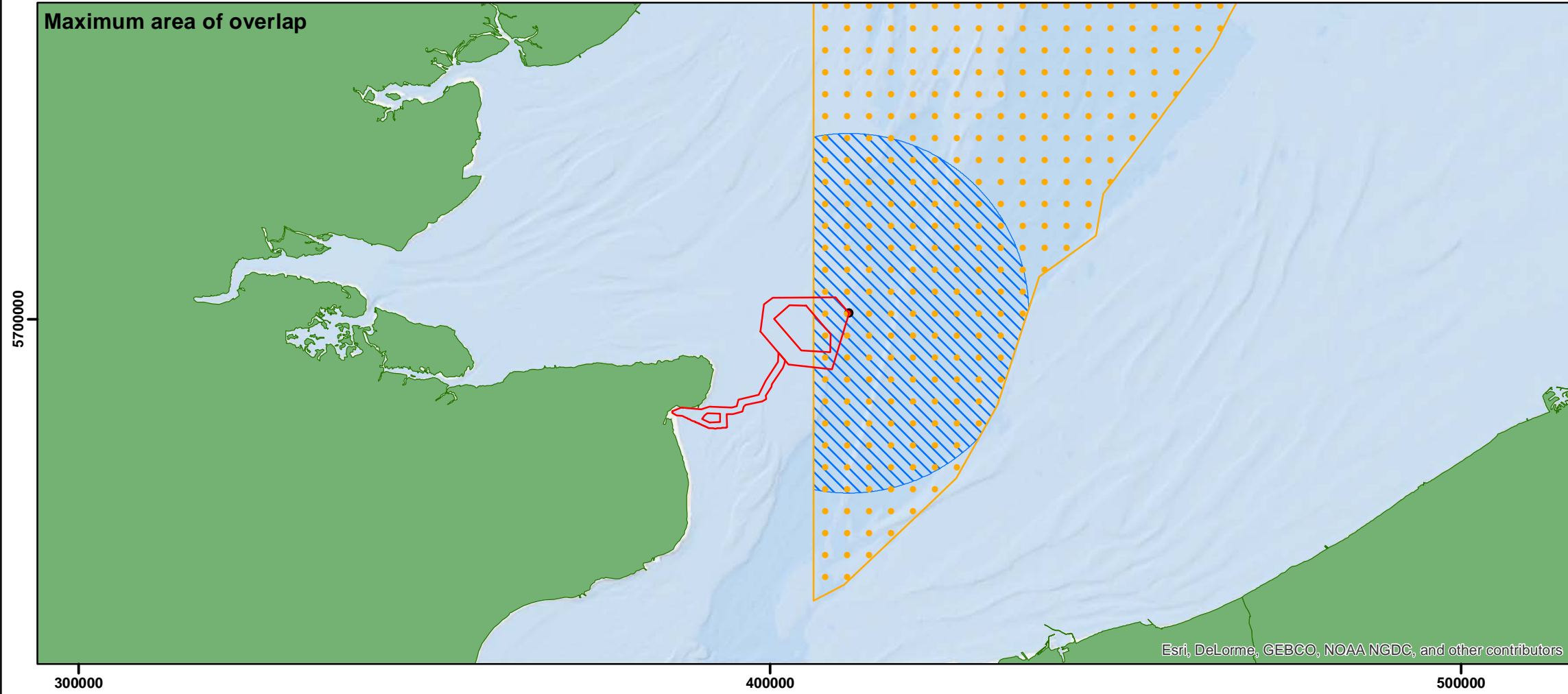
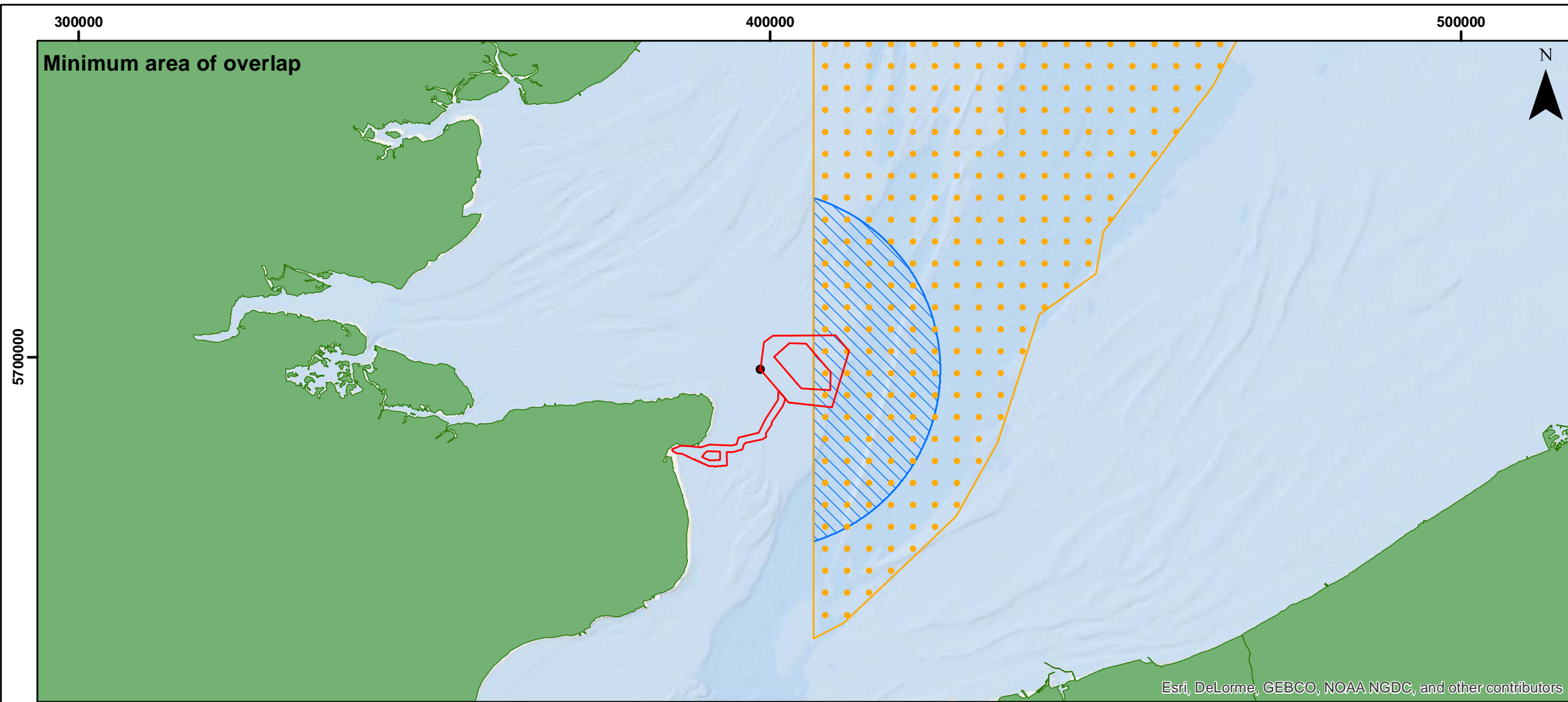
*The number of foundations that may be installed within a 24 hour period will depend on a number of factors, not least the fact that a single piling rig will be deployed which provides a practical limit in itself to the number of foundations that would technically be feasible in that timeframe. However, it is feasible that piling could occur at more than one foundation location within a 24 hour period, the combined footprint from which being subject to numerous variables, namely the location(s) chosen. To enable a maximum spatial extent to be calculated that is representative of all possible variables, a worst-case from a combined number of foundation locations has been calculated (with no other combination or number of locations resulting in a larger spatial effect). That assumption is for piling to occur at up to four foundation locations within a 24 hour period (while acknowledging that such a rate of installation is likely to be greater than that which is technically feasible – however the approach allows for the variables mentioned above).

THANET EXTENSION OFFSHORE WIND FARM

Figure 11.4
Maximum and Minimum
Areas of Overlap with the
SNS cSAC as a Result of a
Single Piling Event

Legend

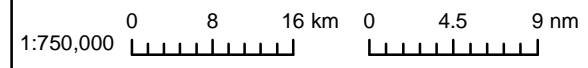
-  Offshore Red Line
-  Southern North Sea
-  Foundation
-  Area of Overlap with the SNS



Datum: ETRS 1989
Projection: UTM31N



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© Contains Natural England and JNCC data 2017.








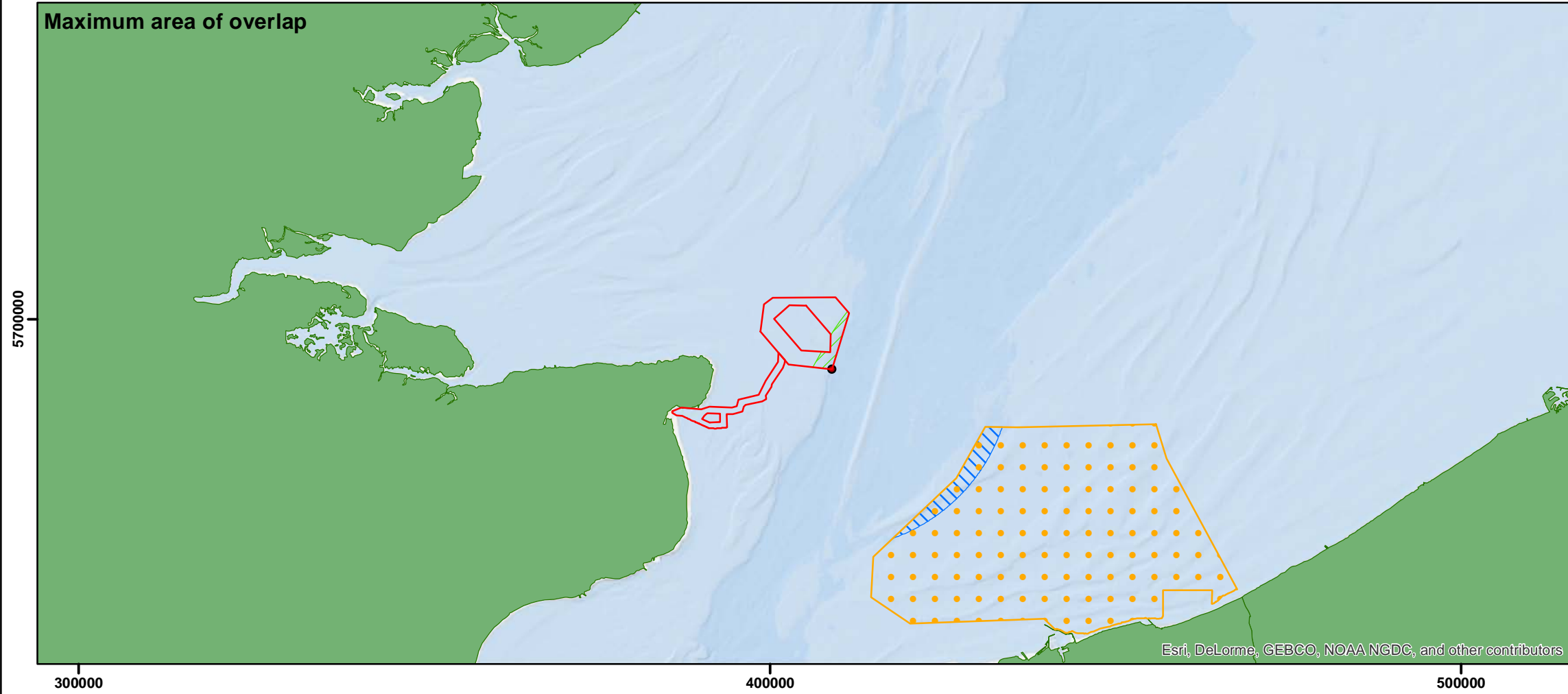
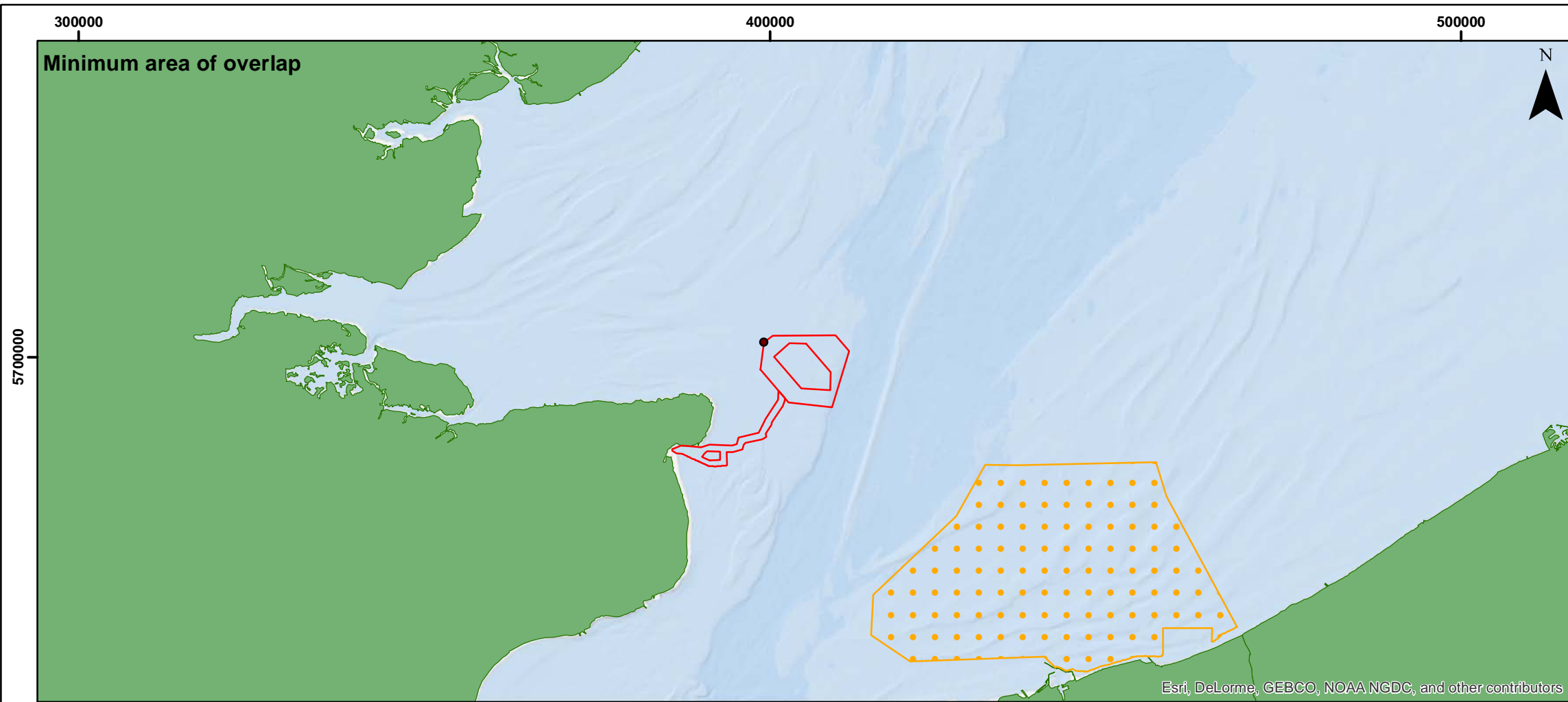
Drg No	Fig11.4_SNScSACPiling			Figure 11.4
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

THANET EXTENSION OFFSHORE WIND FARM

Figure 11.5
Maximum and Minimum Areas of Overlap with the Bancs de Flandres SCI as a Result of a Single Piling Event

Legend

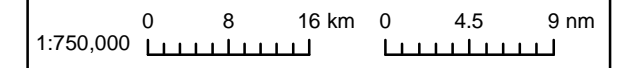
-  Bancs de Flandres SCI
-  Offshore Red Line Boundary
-  Foundation Location
-  Area of Overlap with the Bancs de Flandres SCI
-  Area of overlap between Development Boundary and a 26 km buffer from the Bancs de Flandres SCI - Only piling within this area would result in an effect



Datum: ETRS 1989
Projection: UTM31N



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Drg No	Fig11.5_BancsdeFlanPiling			Figure 11.5
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

- 11.3.54 With respect to the SNS cSAC and for Thanet Extension alone during the winter season only, no foundation piling scenario will result in a spatial effect greater than 20% within a single 24 hour period, reaching 11.71% as a maximum (based on the maximum piling scenario identified in Table 11.3). Therefore, the maximum value of 20% in any given day at the SNS cSAC will not be exceeded by piling at Thanet Extension alone under any circumstance.
- 11.3.55 As regards the Bancs de Flandres SCI for Thanet Extension alone, no foundation piling will result in a spatial effect greater than 20% within a single 24 hour period, reaching 3.83% as a maximum. Therefore, the maximum value of 20% in any given day will not be exceeded by piling at Thanet Extension alone under any circumstance. Further, it is apparent from Figure 11.5 that only foundations installed within a small proportion of the array boundary would result in a spatial overlap with the Bancs de Flandres SCI.
- 11.3.56 The temporal aspect of the threshold (10% across the season) equates to all the piling anticipated to occur within a single season. The overall piling window for Thanet Extension falls across three calendar years (Q1 2021-Q2 2023, however piling will only occur within a six month period within the larger window, although the total duration of piling (including a 60 minute soft start per pile) would only take up to approximately nine days, which would be spread across that window, if all foundations were installed on monopiles and twelve days if all were installed on quadropod jacket foundations. It is not yet determined if that six month period will fall wholly within a single season, or straddle more than one, although given the distance between Thanet Extension and the summer seasonal component, any piling within the summer season will not contribute to the seasonal total of 10%, with only piling that occurs during the winter season to be included for assessment purposes here.
- 11.3.57 Although the maximum spatial extent of effect that could occur within a single day exceeds 10% (being up to 11.71% for the maximum piling scenario within a single 24 hour period), such a rate of piling would require all foundations to be installed within a nine day period and not be spread across the full six months. Such a concentrated rate of installation would ensure that although on a given day, the extent of spatial disturbance could exceed 10% (but not the daily 20% threshold), the short-term nature of such an effect would, when averaged across the season (of 182 days for the winter season) be approximately 0.58% and therefore would not exceed the 10% value. Should piling installation occur at the slowest rate possible (i.e. a maximum of one foundation per day, requiring 36 days of piling within the 182 day winter period), the potential for effect (which would be at most 10.31% in a given day) would average across the season to 2.04%, well below the 10% seasonal limit.
- 11.3.58 For the Bancs de Flandres, the maximum spatial extent of disturbance (which would only occur as a result of piling in a limited extent of the Thanet Extension array boundary) would be up to 3.34% in a single day and therefore, when averaged across a season, there is no possibility of the 10% seasonal limit being exceeded.
- 11.3.59 It is also recognised that it is important to consider return time within the assessments, with evidence suggesting that this may range from a few hours (less than a day – Tougaard *et al.* 2009, Brandt *et al.* 2012, Dahne *et al.* 2013), up to 3 days (Diederichs *et al.* 2009, Brandt *et al.* 2011), between ‘a few hours’ to ‘between one and three days’ (Tougaard *et al.* (2014)) to more precise values of 12 hours (e.g. van Beest *et al.*, 2015) and that the timing of return may vary with distance from noise source and also quality of habitat (i.e. motivation to return) (Brandt *et al.*, 2016). The approximate maximum total duration of piling activity (including the soft start) is presented in Table 5.2: Maximum project design scenario
- 11.3.60 as 9-12 days (depending on the pile type), which would be spread across the overall piling window of 6 months. It is therefore apparent that within the overall piling window, considerable opportunity for return time exists.
- 11.3.61 Specifically, if piling of individual monopiles takes an assumed maximum of 6 hours per pile, assuming a single monopile were installed within a 24 hour period, there would be 18 hours of non-piling time, allowing a measure of return time (depending on the number of foundations installed within that period), or around 16 hours potential return time for quadropod jacket foundations, assuming an individual foundation installed within that 24 hour period. There is therefore, considerable return time within each 24 hour period built into the assessment. Should a faster rate of piling occur (ie more foundations per 24 hours), the total number of days within which piling would occur would be reduced, freeing up additional days within the overall piling window for return.
- 11.3.62 The above assessments of the various piling construction scenarios clearly demonstrate that under no circumstance will any piling scenario exceed the daily maximum or seasonal average at the SNS cSAC or the Bancs de Flandres SCI. Therefore, it is concluded with confidence that there will not be an AEoI of the Conservation Objective as a result of piling related disturbance from Thanet Extension alone and therefore ensure that, subject to natural change, in the long-term, there will be no significant disturbance of harbour porpoise.
- 11.3.63 The third conservation objective is focused on maintaining the availability and density of suitable harbour porpoise prey within the SNS cSAC or Bancs de Flandres SCI. The habitat of the prey referred to is in relation to the characteristics of the seabed and water column, in terms of, for example stable stratified waters, current speed, the particle size of the sediment etc. There is no evidence of a pathway to link underwater noise to the seabed and water column characteristics referred to in the Conservation Objective. Even if such a pathway were to exist, the potential for Thanet Extension as a whole to affect the seabed and water column in terms of the water depth and water column variables referred to in the description of the sites Conservation Objectives has been assessed within the relevant chapters of the Thanet Extension ES application (see Volume 2, Chapter 2, Document Ref. 6.2.2), with the conclusions for all potential impacts throughout the chapter being not significant.

11.3.64 There is, therefore, no AEol to the supporting habitats and processes relevant to harbour porpoise and their prey from Thanet Extension alone and therefore ensure that, subject to natural change, the availability and density of suitable harbour porpoise prey will be maintained in the long-term.

Consideration of Harbour Seal and Grey Seal for RIAA Purposes

11.3.65 To determine the potential for AEol with respect to harbour seal and grey seal within the transboundary sites screened in, consideration is first given to the definition of favourable conservation status being applied as a proxy in the absence of any available conservation objectives for these sites. The following is therefore relevant:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

11.3.66 The nearest site designated for harbour or grey seals is the Bancs de Flandres SCI, some 23 km distant. The remaining transboundary sites are located at increasing distances from Thanet Extension, up to 107 km from the array boundary. The potential for piling noise during construction to affect the conservation status of harbour and grey seals through the above parameters is analogous to that assessed for UXO clearance, albeit piling will occur intermittently over a longer duration (up to six months, with total piling time within that window being 9-12 days).

11.3.67 To mitigate against the potential for lethal or injurious effects, i.e. the viability component, as for UXO clearance a MMMP will be required, enforced through the DCO and so requiring consultation and agreement with statutory bodies. The mitigation will include the 960 m mitigation zone referred to above, thus avoiding the potential to affect the viability of the species.

11.3.68 The ES (Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7)) considers the potential for disturbance in harbour and grey seals during piling. It is disturbance that could temporarily affect the natural range of the species, if that disturbance were sufficient to result in avoidance of areas for a sustained period. The ES found that the maximum number of seals that could elicit a behavioural response during piling (at the maximum hammer energy) would be between 5.2 and 15.8 harbour seals and between 3.0 and 6.1 grey seals. This equates to 0.07 - 0.22% of the UK reference population plus the Wadden Sea population for harbour seals and 0.01-0.02% for grey seals. Actual piling duration, as noted above, will depend on the foundation type chosen but will equate to between 9 and 12 days of piling activity within a 6 month window. The Marine Mammal Technical Report (Volume 4, Document Reference 6.4.7.1) highlighted that the area and range for a fixed seal behavioural threshold was in the order of 1.7-2.8 km and therefore represents a very small proportion of the overall available habitat for seals. Such a level of disturbance, which will be temporary, intermittent and short-term, is not considered sufficient to result in an adverse effect on the natural range of the species in the long-term, particularly given the small proportion of the population affected.

11.3.69 The final measure of conservation status is the availability of sufficiently large habitat. For harbour seal and grey seal, the piling will be temporary and intermittent and within a very small area of the overall available habitat (the small proportion of the population that may be affected indicating the lack of importance of the area in the context of the population and the overall habitat). The extent of physical habitat available will not be affected and therefore the conservation status will remain unaffected.

11.3.70 There is, therefore, no AEol to the harbour seal and grey seal features of the transboundary sites site in relation to underwater noise associated with piling effects from Thanet Extension alone and therefore, subject to natural change, harbour seal and grey seal will not be affected in the long-term with respect to the potential for underwater piling noise.

Increased vessel traffic

11.3.71 The potential for vessel related disturbance on marine mammals alone has been assessed within the existing project literature (see section 7.11 and 7.12 of Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7)).

11.3.72 Underwater noise associated with vessel traffic during construction has the potential to result in disturbance of marine mammals. Disturbance from vessel noise is only likely to occur, however, where increased noise from vessel movements associated with the construction of Thanet Extension is greater than the background ambient noise. The outer Thames Estuary is a busy shipping area; therefore, background noise levels are likely to be high.

11.3.73 Detailed information on the baseline levels of vessel activity in the vicinity of Thanet Extension is provided in Volume 2, Chapter 10: Shipping and Navigation (Document Ref: 6.2.10). Commercial shipping traffic lanes are located within 5 nm of the site, with traffic through the boundaries of Thanet Extension area boundary occurring at a rate of approximately 328 commercial vessel passages per month and many hundreds more occurring around the site boundaries. A Gate Analysis presented in Volume 2, Chapter 10: Shipping and Navigation, assessed the frequency and distribution of traffic flow within nearby shipping routes. Transit rates were up to between 10 and 30 transits per day. These shipping routes are mainly occupied by large commercial cargo vessels, fishing vessels and tankers. As a result, any marine mammals in the vicinity of the site are likely to be habituated to a large volume of ship traffic. The maximum number of construction vessels anticipated on site at any one time is 48, with an average of 29. This is not considered to be a significant increase in total vessel movements. In addition, existing commercial shipping traffic lanes will likely be rerouted to outside of the Thanet Extension boundary, therefore numbers of vessel movements within the boundary of the site will actually decrease as a result of construction and operation resulting in a reduced amount of exposure to vessel noise within the site boundaries.

11.3.74 Comment on shipping effects on harbour porpoise is provided in the SNS cSAC Selection Assessment Document (Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7)), which found the following in relation to the probability of harbour porpoise presence and density:

'There was a negative relationship with increasing levels of traffic beyond a threshold of approximately 80 ships per day'

11.3.75 Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7) of the ES found that there is very little published information on the responses of seals at sea to vessel noise. Jones *et al.* (2017) presents an analysis of the predicted co-occurrence of ships and seals at sea which demonstrates that UK wide there is a large degree of predicted co-occurrence between ships and seals at sea, particularly within 50 km of the coast close to seal haul haul-outs. There is no evidence relating decreasing seal populations with high levels of co-occurrence between ships and animals and areas where seal populations are increasing (e.g. south-east England) and where ship co-occurrences are highest, are experiencing the highest levels of growth (Jones *et al.* 2017).

11.3.76 The ES concluded that the impact of noise disturbance from vessels is predicted to be of local spatial extent, short-term duration and reversible, with a low magnitude for all marine mammal species. Given the proximity of shipping channels and the use of the site by other vessels, it is likely that marine mammals using this area are habituated to this type of underwater noise. The sensitivity for all marine mammal species is determined in the ES as being low. The effect was therefore concluded to be of minor significance, which is not significant in EIA terms.

Consideration of Harbour Porpoise for RIAA Purposes

11.3.77 The existing vessel traffic movements within the array boundary (up to 10-30 per day), combined with the average increase in vessel numbers per day (29 and up to 48 as a maximum, the latter considered unlikely as construction activities will be staggered), remains below the approximately 80 movements per day found within Volume 1, Chapter 4: Site Selection and Alternatives (Document 6.1.4) to have a negative effect on harbour porpoise. When considering the existing shipping levels, it should be noted that the Shipping and Navigation Chapter (Volume 2 Chapter 10) assumes that, as a worst-case, all existing shipping currently passing through Thanet Extension boundary would take alternative routes.

11.3.78 As noted above, the relevant conservation objectives for harbour porpoise are to ensure that, subject to natural change, the following attributes are maintained or restored in the long-term:

- The species is a viable component of the site.
- There is no significant disturbance of the species.
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

11.3.79 The viability component specifically relates to activities that kill, injure or significantly disturb harbour porpoise, although the disturbance element can be considered within the second conservation objective. The marine mammal chapter of the ES (Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7)) limited consideration of underwater noise in relation to vessel traffic to the potential for disturbance; underwater noise from vessel traffic is insufficient to result in mortality or injury in marine mammals.

11.3.80 The second conservation objective relates to significant disturbance. However, given the existing level of vessel activity within the region, combined with the relatively small increase in vessel numbers, it can be concluded that the construction of Thanet Extension will not significantly increase existing levels of disturbance for harbour porpoise within the SNS cSAC (and therefore can have no significant effect on the geographically more distant site of Bancs de Flandres).

11.3.81 The third conservation objective is focused on maintaining the availability and density of suitable harbour porpoise prey within the cSAC. The habitat of the prey referred to is in relation to the characteristics of the seabed and water column. There is no evidence of a pathway to link underwater noise to the seabed and water column characteristics referred to in the conservation objective. The relevance of the conservation objective for Thanet Extension therefore stems from the potential for underwater noise to have an adverse effect on harbour porpoise prey that live within these habitats. The HRA Screening Report (Annex 1, Document Ref: 5.2.1) and subsequent updates (section 7) concluded no potential for LSE in relation to a change in prey availability and behaviour for harbour porpoise.

11.3.82 There will therefore be no AEoI to the harbour porpoise feature of the SNS cSAC of the Bancs de Flandres SCI in relation to vessel disturbance during construction from Thanet Extension alone and therefore, subject to natural change, the harbour porpoise feature will be maintained in the long-term.

Consideration of Harbour Seal and Grey Seal for RIAA Purposes

11.3.83 As noted in section 9, the definition of favourable conservation status is being applied for harbour seal and grey seal in relation to the transboundary sites screened in. This is defined as follows:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

11.3.84 As concluded for the viability aspect for harbour porpoise, underwater noise from vessel traffic is insufficient to result in mortality or injury in marine mammals. The potential for disturbance of harbour and grey seals can similarly be concluded to be not significant, given the existing levels of shipping and the lack of evidence linking a reduction in seal populations to shipping. As regards the natural range of harbour seal and grey seals, it should be noted that the screening range for such sites is significant (120 km for harbour seals and 145 km for grey seals), with the closest transboundary site screened in being some 23 km distant. The Marine Mammals Chapter to the ES (Volume 2, Chapter 7) found, based on typical construction vessel frequencies, that harbour and grey seal would be expected to detect such vessels at ranges of up to 20 km. Thanet Extension array boundary, at 73 km², represents a very small percentage of the potential habitat available to seals associated with each site screened in. In any case, the habitat within Thanet Extension array will not be lost to seals and therefore the natural range of the species and availability of habitat will not be reduced and will be maintained.

11.3.85 There is, therefore, no AEoI to the harbour seal and grey seal features of the transboundary sites in relation to increased vessel traffic from Thanet Extension alone and therefore, subject to natural change, the harbour porpoise, harbour seal and grey seal features of these sites will be maintained in the long-term.

Cable installation, seabed preparation and drilling for foundation installation

11.3.86 Other, non-piling underwater noise sources include cable installation techniques (such as ploughing, trenching, rock dumping and jetting), dredging of the seabed prior to cable or foundation installation and drilling for foundation installation. Information on the sound produced by the specific vessels and construction activities for this project are not available, however, parallels can be drawn from similar projects and vessels. Previously, Subacoustech have provided estimated noise levels for cable laying, rock placing and trenching as 171 - 172 dB re 1µPa @ 1m (RMS) which is considerably lower than that produced by pile driving (244 - 247 dB re 1µPa @ 1m SPLpeak), therefore, during the period of piling operations it is therefore considered unlikely that these activities will impact marine mammal receptors at anything other than immediate proximity. Individuals have more potential to be impacted by these activities during periods when piling is not taking place.

11.3.87 In another example, Xodus Group Ltd (2015) conducted noise modelling for a cable laying vessel, similar to the type which will be used for the construction of this project. This modelling concluded that the radius of potential injury from cable laying vessels was 25 m for Low Frequency (LF) cetaceans, 15 m for Mid Frequency (MF) cetaceans, 12 m for High Frequency (HF) cetaceans and 50 m for pinnipeds – assuming continuous exposure within that radius over a 24 hour period. These values mean that animals would have to stay within these very small ranges for 24 hours before they experienced injury, which is an extremely unlikely scenario as it is far more likely that any marine mammal within the injury zone would move away from the vicinity of the vessel.

11.3.88 The potential effects of cabling techniques used in the offshore wind farm industry was reviewed in a report by BERR in association with DEFRA (BERR and DEFRA 2008). The report reviewed various cable types and installation methods including burial ploughs, machines, ROVs and sleds and the burial methods themselves including jetting, rock ripping, and dredging. The review concluded that it would be “highly unlikely that cable installation would produce noise at a level that would cause a behavioural reaction in marine mammals”.

11.3.89 Subacoustech estimated noise levels for dredging as 186 dB re 1µPa @ 1m (RMS). However, most of the noise emitted is broadband with frequencies below 1 kHz, it is unlikely to cause any auditory injury, and is more likely to cause masking and behavioural impacts for lower frequency cetacean species (Todd *et al.* 2015) which are not of concern at Thanet Extension.

- 11.3.90 The behavioural impacts of non-piling underwater construction noise have been previously assessed for a number of other projects. Results have been previously expressed based on the dBht level (species weighted, which takes account of the frequency range of hearing of a species), where 90 dBht is a “strong avoidance in virtually all individuals” and 75 dBht is a “mild behavioural reaction” (Nedwell *et al.* 2007). The estimated behavioural impact ranges were higher for harbour porpoise compared to harbour seals, and extended furthest for trenching and rock dumping activities with “mild behavioural reactions” predicted out to 640 m from trenching. While these impact ranges are indicative, due to the generic nature of the activities assessed, effects are likely to be small scale and temporary, therefore disturbance as a result of non-piling construction noise is assessed as being low magnitude and low sensitivity for all marine mammal species, resulting in an overall minor significance which is not significant in EIA terms.
- 11.3.91 Given the nature of underwater noise associated with such non-piling construction activity when compared to that during piling operations, together with the known reaction of marine mammals to such non-piling related construction noise, it is reasonable to conclude that the potential for an AEol in relation to the SNS cSAC and the transboundary sites for harbour porpoise, harbour seal and grey seal is less than that concluded during piling. There is, therefore, no AEol to the harbour porpoise, harbour seal and grey seal features in relation to non-piling related construction noise from Thanet Extension alone and therefore, subject to natural change, the harbour porpoise, harbour seal and grey seal features of these sites will be maintained in the long-term.

Geophysical survey

- 11.3.92 Geophysical survey, by definition, results in the emission of underwater noise. The pre-construction geophysical survey for Thanet Extension is planned to occur prior to the UXO clearance and the piling, however dates (or the relevant season) have not yet been confirmed. At the earliest, the survey could occur in 2019 (with 2020 being more likely). At its closest point, the array boundary is located some 229 km from the summer extents of the SNS cSAC and at least 23 km from all transboundary sites screened in; all these transboundary sites and the summer seasonal component of the SNS cSAC lie beyond the 5 - 10 km harbour porpoise EDR range for geophysical survey. The assessment is therefore limited to the winter extents of the SNS cSAC, partly due to the EDR but also, primarily for harbour and grey seals, given the much reduced spatial and temporal effect resulting from geophysical surveys compared to construction piling and how that relates to the much larger extent of available habitat (with construction piling resulting in no AEol for the project alone for all sites).
- 11.3.93 The potential for the geophysical survey to affect the viability of harbour porpoise in relation to the SNS cSAC is a function of the type and nature of the survey. Should particularly high energy sources be required (such as air guns), relevant JNCC guidance⁷³ will be followed to mitigate potential significant effects. As regards potential for disturbance, as a worst-case scenario, if it assumed that the geophysical survey would cover the array, the potential for a spatial disturbance effect to occur within the SNS cSAC can be determined. Based on a 5 km buffer, the spatial effect would be up to 166 km² (1.31% of the winter component), and based on a 10 km buffer, up to 370 km² (2.92% of winter component) would be affected. These areas are significantly below both the 20% threshold for a single day and as they are below 10% in a day, the 10% threshold across a season could not be exceeded. The potential for such a survey to affect the third conservation objective remains as assessed for piling noise.
- 11.3.94 It is reasonable to conclude that the potential for an AEol in relation to geophysical survey for the SNS cSAC and the transboundary sites for harbour porpoise, harbour seal and grey seal is less than that concluded during piling. There is, therefore, no AEol to the harbour porpoise, harbour seal and grey seal features in relation to underwater noise associated with a project geophysical survey from Thanet Extension alone and therefore, subject to natural change, the harbour porpoise, harbour seal and grey seal features of these sites will be maintained in the long-term.





⁷³ http://jncc.defra.gov.uk/marine/seismic_survey

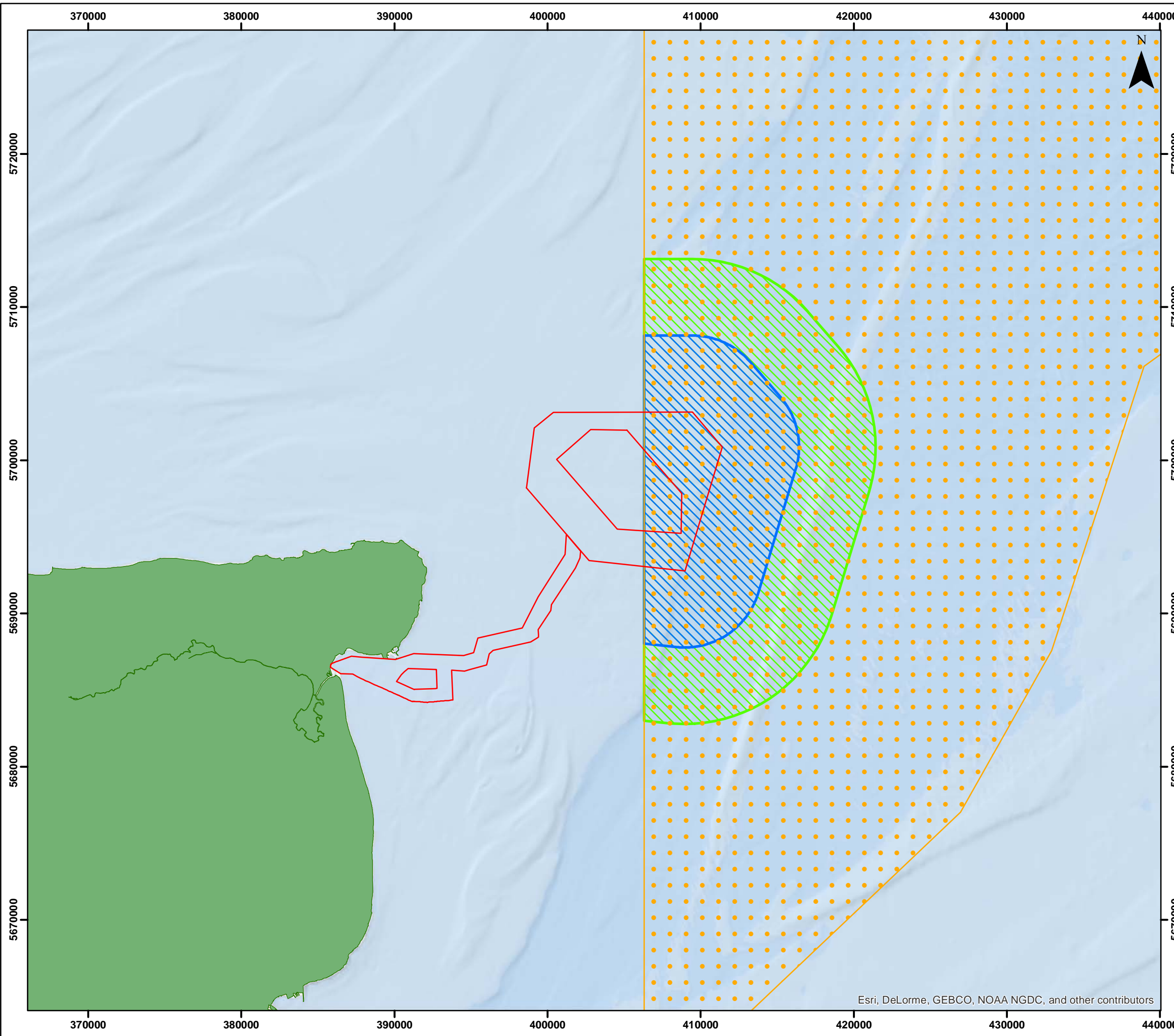
Table 11.4: Spatial Extent of Disturbance within the Designated Sites

Designated Site	Potential Effect from Geophysical Survey	
	Area of effect (km ²)	% of site/ winter seasonal component
Assumed 10 km buffer for survey		
SNS cSAC	Max: 370 km ²	Max: 2.92% (winter extents)
Bancs de Flandres SCI	Max: 0 km ²	Max: 0% (total SCI)
Assumed 10 km buffer for survey		
SNS cSAC	Max: 370 km ²	Max: 2.92% (winter extents)
Bancs de Flandres SCI	Max: 0 km ²	Max: 0% (total SCI)

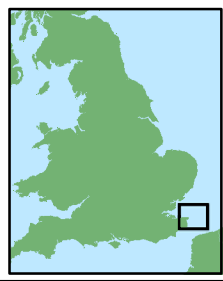
THANET EXTENSION OFFSHORE WIND FARM

Figure 11.6
Spatial Extent of Possible
Geophysical Surveys (if
required) with the SNS cSAC

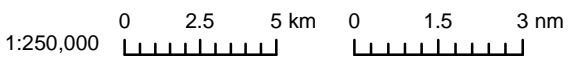
- Legend**
-  Offshore Red Line Boundary
 -  Southern North Sea cSAC
 -  5 km Buffer Overlap with the SNS cSAC
 -  10 km Buffer Overlap with the SNS cSAC



Datum: ETRS 1989
Projection: UTM31N



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Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

Drg No	Fig11.6_GeophysSNScSAC		
Rev	0.1	Date	27/04/2018
By	RM	Layout	N/A

**Figure
11.6**

Use of Acoustic Deterrent Devices as part of marine mammal mitigation

- 11.3.95 As noted above, part of the mitigation for the project includes a MMMPs (as separate MMMPs for both UXO clearance, if required, and piling). It is anticipated that provision might be made within the MMMPs for the use of ADDs. The intended effect of the use of the ADD (combined with the use of a soft start) would be to reduce the risk that marine mammals would be in proximity to the source of piling noise/ UXO clearance, to mitigate against the risk of mortality or PTS. The application of the ADD will be short-term and temporary (the duration would be specific to the requirements of piling or UXO clearance, to be agreed with SNCBs) prior to each event, with only one active deployment at any one time. The level of noise associated with the use of ADDs would be significantly less than that generated during piling or UXO clearance and certainly contained within the EDR of the greater activity.
- 11.3.96 Use of ADDs has led to a conclusion of no LSE in previous assessments for the SNS cSAC (e.g. Hornsea P2 and East Anglia ONE), that conclusion being a function of the type of noise, its scale and duration of potential effect. That conclusion is considered to apply equally here, if not more so given the location of Thanet Extension in relation to the SNS cSAC (i.e. a significant proportion of ADD use would occur outside the SNS cSAC boundary).

Multiple Activities in a Single Winter Season

- 11.3.97 It is clear that for Thanet Extension alone, when individual project activities are considered independently, that there is no potential for an AEoI on either the SNS cSAC or the Bancs de Flandres SCI. However, given the short-term nature of the piling operations and anticipated level of UXO clearances, there is potential for all noisy activities to occur within a relatively short period of time – although no more than one such activity (i.e. piling OR UXO clearance OR geophysical survey) would occur within a single 24 hours and therefore the 20% threshold would not be exceeded.
- 11.3.98 Timing of such activities is relevant to the SNS cSAC, specifically with respect to the 10% threshold that is required to be met across a season. For Thanet Extension, this applies to the winter season only (given the distance to the summer seasonal extents). As the timing of the geophysical survey, the UXO clearance and the start date of piling operations will not be confirmed until closer to construction (although the geophysical survey and UXO clearance could occur as early as 2019 but is more likely to occur from 2020), a worst-case temporal assumption has been made here that all that activity could occur within a single winter season. The assumption is applied to enable a worst-case scenario to be assessed and the potential for Thanet Extension alone as a whole to affect the 10% seasonal threshold to be tested.

- 11.3.99 The assessment has applied the following assumptions:

- Piling to occur at 36 foundation locations within a six month winter season, assuming (as the worst-case) foundations to be installed individually (i.e. only one foundation per day), with a maximum spatial effect per day of 10.31% and duration of 36 days;
- Up to 30 UXO clearances on 30 separate days, each resulting in a maximum spatial area of effect of 10.31%; and
- Geophysical survey, with an assumed 10 km buffer and therefore maximum spatial extent of effect of 2.92%, lasting 10 days.

- 11.3.100 Should all the above activity occur at Thanet Extension within the same 6 month period (wholly within a single winter season), the combined affect when averaged across that season would be 3.90%, and therefore would remain well below the 10% seasonal threshold and therefore there would be no potential for an AEoI to the SNS cSAC. It is also apparent that capacity exists for additional UXO clearances, or a longer geophysical survey period, if required and appropriately managed (particularly taking account of any in-combination issues), without exceeding the threshold.

Marine Mammal Conclusion

- 11.3.101 The above assessment considers AEoI of the SNS cSAC and transboundary sites for harbour porpoise, harbour seal and grey seal from Thanet Extension alone during construction and decommissioning. The assessment draws on the consideration of LSE alone made in the Screening Matrix (Annex 2, Document Ref: 5.2.2), which concluded that the potential for LSE relates to underwater noise during construction only.
- 11.3.102 Each of the Conservation Objectives for harbour porpoise, and for seals the requirements for FCS, have been considered in turn, to enable an assessment of the potential to lead to an AEoI. In each case, the conclusion of no AEoI from Thanet Extension alone has been confidently drawn, with quantified evidence presented to demonstrate how the effects will not exceed thresholds under any construction scenario.
- 11.3.103 It can therefore be concluded that, with the mitigation in place (as per section 6), Thanet Extension alone will not lead to an AEoI of the SNS cSAC or transboundary sites screened in for marine mammals during construction or decommissioning and therefore ensure that, subject to natural change, the sites will be maintained in the long-term.

11.4 Offshore Ornithology

11.4.1 A description of the significance of project level effects upon the receptors grouped under 'offshore ornithology' is provided below.

Construction and Decommissioning

Disturbance and Displacement

11.4.2 The potential for disturbance and displacement to result in an AEoI relates to the following designated sites and the relevant features:

- Outer Thames Estuary SPA; red-throated diver;
- Flamborough and Filey Coast pSPA; guillemot, razorbill and the breeding seabird assemblage in so far as that includes guillemot and razorbill;
- Northumberland Marine SPA; guillemot and the breeding seabird assemblage in so far as that includes guillemot;
- Farne Islands SPA; guillemot and the breeding seabird assemblage in so far as that includes guillemot; and
- St Abb's Head to Fast Castle SPA; guillemot and razorbill and the breeding seabird assemblage in so far as that includes guillemot and razorbill.

11.4.3 The construction phase has the potential to affect birds in the marine environment through disturbance due to construction activities, including the installation of foundations, towers, blades, export cables and other infrastructure and the movement of vessels and helicopters. The disturbance created has the potential to result in displacement of birds from the site of construction, from an area around it and from routes used by vessels to access the construction site. This displacement would effectively result in temporary habitat loss through a reduction in the area available to birds for feeding, resting and moulting.

11.4.4 Any impacts resulting from disturbance and displacement from these activities are considered to be short-term, temporary and reversible in nature, lasting only for the duration of construction activity, as birds would return to the area once construction activities have ceased. Disturbance and displacement of birds during the construction phase is most likely to affect birds foraging in and around the construction area. The level of disturbance at each work location would differ dependent on the activities taking place, but there could be vessel movements at any time of day or night over the entire construction period.

11.4.5 Some species are more susceptible than others to disturbance from construction activities which may lead to subsequent displacement. Species such as divers have been noted to avoid shipping with one study identifying red-throated diver flushing at a median value of 400 m and a maximum value of 2 km (Bellebaum *et al.*, 2006).

11.4.6 There are a number of different measures used to assess bird disturbance and displacement from areas of sea in response to activities associated with an offshore wind farm. Garthe and Hüppop (2004) developed a scoring system for such disturbance factors, which is used widely in OWF EIAs. Furness and Wade (2012) developed disturbance ratings for particular species, alongside scores for habitat flexibility and conservation importance in Scottish waters. These factors were used to define an index value that highlights the sensitivity of a species to disturbance and displacement. As many of these references relate to disturbance from helicopter and vessel activities, these are considered relevant to this assessment. Bradbury *et al.* (2014) provided an update to the Furness and Wade (2012) paper to consider seabirds in English waters. More recently a joint SNCB interim displacement advice note (SNCBs, 2017) provides the latest advice for UK development applications on how to consider, assess and present information and potential consequences of seabird displacement from OWFs.

Outer Thames Estuary SPA - red-throated diver

11.4.7 Red-throated diver has been identified as being particularly sensitive to human activities in marine areas, including through the disturbance effects of ship and helicopter traffic (Garthe and Hüppop, 2004, Schwemmer *et al.*, 2011, Furness and Wade, 2012, Wade *et al.*, 2016; SNCBs, 2017).

11.4.8 During the construction period red-throated divers may be subject to potential disturbance and displacement from Thanet Extension and potentially around it as well as the OECC, due to activities associated with the installation of WTGs and vessel movements in and out of the site. However, construction activities will be limited spatially, as construction works will not simultaneously occur at all WTG locations. The evidence from the TOWF during-construction monitoring surveys is that displacement of red-throated divers within the site was 82% and beyond the site boundary there was no displacement (Royal HaskoningDHV, 2013). Consequently, any potential effects are predicted to be limited to within a sphere of influence within Thanet Extension (with the site based evidence rounded up on a precautionary basis to the next 5% category value as 85% predicted displacement for the purposes of the application of a numeric value in the displacement matrices) and not extend into the 4 km distance around it.

11.4.9 The peak seasonal density recorded (from which peak seasonal abundance can be derived) was during the winter period when red-throated divers were present in Thanet Extension with a mean peak density of 2.66 birds/ km² or an abundance of 194 individuals. If an 85% displacement rate is applied to the winter red-throated diver population within Thanet Extension then an estimated 165 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of red-throated divers potentially subject to mortality is between zero and eight individuals. The displacement matrix for a population of 194 red-throated divers is presented in Table 11.5.

Table 11.5: Displacement matrix presenting the number of red-throated divers in the Thanet Extension site only, during the winter bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	1	2	2	2
10	0	0	1	2	4	6	8	10	12	14	16	17	19
20	0	0	2	4	8	12	16	19	23	27	31	35	39
30	0	1	3	6	12	17	23	29	35	41	47	52	58
40	0	1	4	8	16	23	31	39	47	54	62	70	78
50	0	1	5	10	19	29	39	49	58	68	78	87	97
60	0	1	6	12	23	35	47	58	70	81	93	105	116
70	0	1	7	14	27	41	54	68	81	95	109	122	136
80	0	2	8	16	31	47	62	78	93	109	124	140	155
85	0	2	8	16	33	49	66	82	99	115	132	148	165
90	0	2	9	17	35	52	70	87	105	122	140	157	175
100	0	2	10	19	39	58	78	97	116	136	155	175	194

11.4.10 The peak seasonal density recorded in the spring migration period when red-throated divers were present in the Thanet Extension site with a mean peak density of 0.60 birds/km² or an abundance of 44 individuals. If an 85% displacement rate is applied to the spring migration red-throated diver population within the Thanet Extension site then an estimated 37 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of red-throated divers potentially subject to mortality is between zero and two individuals. The displacement matrix for a population of 44 red-throated divers is presented in Table 11.6.

Table 11.6: Displacement matrix presenting the number of red-throated divers in the Thanet Extension site only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	2	2	3	3	4	4	4
20	0	0	0	1	2	3	4	4	5	6	7	8	9
30	0	0	1	1	3	4	5	7	8	9	11	12	13
40	0	0	1	2	4	5	7	9	11	12	14	16	18
50	0	0	1	2	4	7	9	11	13	15	18	20	22
60	0	0	1	3	5	8	11	13	16	18	21	24	26
70	0	0	2	3	6	9	12	15	18	22	25	28	31
80	0	0	2	4	7	11	14	18	21	25	28	32	35
85	0	0	2	4	7	11	15	19	22	26	30	34	37
90	0	0	2	4	8	12	16	20	24	28	32	36	40
100	0	0	2	4	9	13	18	22	26	31	35	40	44

11.4.11 When the two seasons are combined when red-throated diver are present (winter and spring migration) the collective total is 202 individuals.

11.4.12 None of the red-throated diver that were recorded within Thanet Extension can be directly attributed to the Outer Thames Estuary SPA population as none were recorded within that SPA (the areas of Thanet Extension and the SPA being mutually exclusive). It can be expected though that red-throated diver are mobile across the general area and that birds that occur at any one time outside the SPA might occur within it at another time. The population estimate for the wider Thames Estuary area from which the Outer Thames Estuary SPA was derived was 8,132 birds (O'Brien *et al.*, 2012). From the same population distribution data the boundary of the Outer Thames Estuary SPA was defined and identified as including 6,466 individuals. From these two population figures it can be determined that 79.5% of the total population can be attributed to the Outer Thames Estuary SPA at any one time. This value can also be used to attribute the proportion of the birds using Thanet Extension that might, given regular mixing of the population between areas within and outside the SPA, be associated with the SPA. The combined peak seasonal abundance recorded was 202 individuals, from which 161 could be attributed to the SPA on this basis. Even if all these birds were subject to mortality as a result of disturbance and displacement this would represent 2.5% of the population of the Outer Thames Estuary SPA. As described above, displacement resultant mortality is predicted to be in the range of 1 - 5% with a resultant mortality prediction between two and eight individuals. Eight individuals represent 0.1% of the Outer Thames Estuary SPA population. Background annual survival of red-throated diver has been estimated as 0.84 (Robinson, 2017). On this basis 1,035 individuals out of the population of the Outer Thames Estuary SPA might be expected to die each year. The eight individuals identified above as being the prediction for displacement resultant mortality from the construction of Thanet Extension is a 0.7% increase in background mortality. This very small, temporary increase in mortality makes no material difference to the long-term maintenance of the red-throated diver population of the Outer Thames Estuary SPA.

11.4.13 As part of the consideration of the potential for AEoI, account has also to be taken of the fact that construction works are temporary and localised in nature.

11.4.14 There is, therefore, no potential for AEoI to the red-throated diver feature of the Outer Thames Estuary SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, red-throated diver will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Flamborough and Filey Coast pSPA - Guillemot

11.4.15 Guillemots are considered to have Low to Medium general sensitivity to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Furness and Wade (2012), Wade *et al.* (2016) and the SNCB guidance (SNCBs, 2017).

11.4.16 During the construction period guillemots may be subject to potential disturbance and displacement from Thanet Extension and potentially around it as well as the OECC, due to activities associated with the installation of WTGs and vessel movements in and out of the site. However, construction activities will be limited spatially, as construction works will not simultaneously occur at all WTG locations. The evidence from the TOWF during-construction monitoring surveys is that displacement of guillemots within the site was 67% and beyond the site boundary up to 25% displacement within a 1 km distance around it occurred (Royal HaskoningDHV, 2013). This local site based evidence is applied and any potential effects are predicted to be limited to within a sphere of influence within Thanet Extension and a 1 km distance around it only. This local site based evidence has been rounded up on a precautionary basis to the 5% category value of 70% for within the site and 25% within a 1 km distance around it (this rounding is for the purposes of the application of a numeric value in the displacement matrices).

11.4.17 Guillemot numbers peaked in the spring migration period in Thanet Extension with a mean peak density of 8.26 birds/km² and a mean peak abundance estimate of 602 individuals. Within the 4 km survey buffer around Thanet Extension numbers also peaked in the spring migration period with a mean peak density of 5.39 birds/km² and a mean peak abundance estimate of 1,142 individuals.

11.4.18 If a 70% displacement rate is applied to the spring migration mean peak estimate of 602 within Thanet Extension then an estimated 421 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of guillemots potentially subject to mortality is between four and 21 individuals. The displacement matrix for a population of 602 guillemots is presented in **Table 11.7**.

Table 11.7: Displacement matrix presenting the number of guillemots in the Thanet Extension site only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	2	2	3	4	4	5	5	6
10	0	1	3	6	12	18	24	30	36	42	48	54	60
20	0	1	6	12	24	36	48	60	72	84	96	108	120
30	0	2	9	18	36	54	72	90	108	126	144	163	181
40	0	2	12	24	48	72	96	120	144	169	193	217	241
50	0	3	15	30	60	90	120	151	181	211	241	271	301
60	0	4	18	36	72	108	144	181	217	253	289	325	361
70	0	4	21	42	84	126	169	211	253	295	337	379	421
80	0	5	24	48	96	144	193	241	289	337	385	433	482
90	0	5	27	54	108	163	217	271	325	379	433	488	542
100	0	6	30	60	120	181	241	301	361	421	482	542	602

11.4.19 If a 25% displacement rate is applied to the spring migration peak estimate of 235 within the 1 km distance around Thanet Extension then an estimated 59 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of guillemots potentially subject to mortality is between one and three individuals. The displacement matrix for a population of 253 guillemots is presented in Table 11.8.

Table 11.8: Displacement matrix presenting the number of guillemots in the 1 km Buffer only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	2	2	2	2
10	0	0	1	2	5	7	9	12	14	16	19	21	23
20	0	0	2	5	9	14	19	23	28	33	38	42	47
25	0	1	3	6	12	18	23	29	35	41	47	53	59
30	0	1	4	7	14	21	28	35	42	49	56	63	70
40	0	1	5	9	19	28	38	47	56	66	75	84	94
50	0	1	6	12	23	35	47	59	70	82	94	106	117
60	0	1	7	14	28	42	56	70	84	99	113	127	141
70	0	2	8	16	33	49	66	82	99	115	131	148	164
80	0	2	9	19	38	56	75	94	113	131	150	169	188
90	0	2	11	21	42	63	84	106	127	148	169	190	211
100	0	2	12	23	47	70	94	117	141	164	188	211	235

11.4.20 The mean peak numbers in the breeding season, autumn migration and winter periods were considerably lower and these can be added to the peak seasonal numbers for the spring migration period described above to produce an annual total. Collectively, the total number of potentially displaced guillemots on an annual basis (in this case all four seasons) would be 986 individuals within the Thanet Extension site and 449 in a 1 km buffer surrounding Thanet Extension. If 70% and 25% displacement rates are applied to these annual totals created by summing across the seasons to the Thanet Extension site and the 1 km buffer respectively then an estimated 690 and 112 individuals, or 802 in total, may be subject to potential displacement. The estimated number of guillemots potentially subject to mortality per annum would therefore be between eight and 40 individuals (this is based upon mortality rates of 1% or 5%).

11.4.21 None of the guillemot that was recorded within and around Thanet Extension can be directly attributed to the Flamborough and Filey Coast pSPA. It can be expected that outside the breeding season guillemot from the Flamborough and Filey Coast pSPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Flamborough and Filey Coast pSPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 114,003 birds to the total (calculated on the basis of an SPA population 41,607 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 114,003). From these two population figures it can be determined that 7.5% of the total population in the UK waters of the North Sea can be attributed to the Flamborough and Filey Coast pSPA at any one time.

11.4.22 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis (recognising that this is precautionary as that any total includes breeding season birds which clearly cannot be attributed to the pSPA) of between eight and 40 individuals. Forty individuals represent 0.035% of the Flamborough and Filey Coast pSPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 6,156 individuals out of the population of the Flamborough and Filey Coast pSPA. The 40 individuals identified above as being the prediction for displacement 5% resultant mortality from the construction of Thanet Extension is a 0.65% increase in background mortality of the Flamborough and Filey Coast pSPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the Flamborough and Filey Coast pSPA.

11.4.23 As part of the consideration of the potential for AEoI, account has also to be taken of the fact that construction works are temporary and localised in nature.

11.4.24 There is, therefore, no potential for AEoI to the guillemot feature of the Flamborough and Filey Coast pSPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Flamborough and Filey Coast pSPA - Razorbill

11.4.25 Razorbills are considered to have Medium general sensitivity to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Furness and Wade (2012), Wade *et al.* (2016) and the SNCB guidance (SNCBs, 2017).

11.4.26 During the construction period razorbills may be subject to potential disturbance and displacement from Thanet Extension and possibly around it as well as the OECC, due to activities associated with the installation of WTGs and vessel movements in and out of the site. However, construction activities will be limited spatially, as construction works will not simultaneously occur at all WTG locations. The evidence from the TOWF during-construction monitoring surveys is that displacement of razorbills within the site was 89% and beyond the site boundary, possibly up to 25% (but not significant) displacement within a 1 km distance around it occurred (Royal HaskoningDHV, 2013). Consequently, any potential effects are predicted to be limited to within a sphere of influence within Thanet Extension and a 1 km distance around it only. This local site based evidence has been rounded up on a precautionary basis to the 5% category value of 90% for within the site and 25% within a 1 km distance around it (this rounding is for the purposes of the application of a numeric value in the displacement matrices).

11.4.27 Razorbills were recorded within Thanet Extension predominantly during the migration-spring and winter periods with mean peak estimates of 29 and 28 individuals, respectively (or densities of 0.40 and 0.38 birds/ km²). Razorbills were also recorded within the 4 km buffer, mostly during the migration-spring period, but also the migration autumn and winter periods, with mean peak estimates of 215, 52 and 71 individuals, respectively (or densities of 1.02, 0.25 and 0.33 birds/ km²).

11.4.28 If a 90% displacement rate is applied to the spring migration mean peak estimate of 29 within Thanet Extension then an estimated 26 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of razorbills potentially subject to mortality is between zero and one individual. The displacement matrix for a population of 29 razorbills is presented in Table 11.9.

Table 11.9: Displacement matrix presenting the number of razorbills in the Thanet Extension site only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	1	1	2	2	2	3	3
20	0	0	0	1	1	2	2	3	3	4	5	5	6
30	0	0	0	1	2	3	3	4	5	6	7	8	9
40	0	0	1	1	2	3	5	6	7	8	9	10	12
50	0	0	1	1	3	4	6	7	9	10	12	13	15
60	0	0	1	2	3	5	7	9	10	12	14	16	17
70	0	0	1	2	4	6	8	10	12	14	16	18	20
80	0	0	1	2	5	7	9	12	14	16	19	21	23
90	0	0	1	3	5	8	10	13	16	18	21	23	26
100	0	0	1	3	6	9	12	15	17	20	23	26	29

11.4.29 If a 25% displacement rate is applied to the spring migration peak estimate of 44 within the 1 km distance around Thanet Extension then an estimated 11 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of razorbills potentially subject to mortality is between zero and one individual. The displacement matrix for a population of 44 razorbills is presented below:

Table 11.10: Displacement matrix presenting the number of razorbills in the 1 km Buffer only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	2	2	3	3	4	4	4
20	0	0	0	1	2	3	4	4	5	6	7	8	9
25	0	0	1	1	2	3	4	6	7	8	9	10	11
30	0	0	1	1	3	4	5	7	8	9	11	12	13
40	0	0	1	2	4	5	7	9	11	12	14	16	18
50	0	0	1	2	4	7	9	11	13	16	18	20	22
60	0	0	1	3	5	8	11	13	16	19	21	24	27
70	0	0	2	3	6	9	12	16	19	22	25	28	31
80	0	0	2	4	7	11	14	18	21	25	28	32	36
90	0	0	2	4	8	12	16	20	24	28	32	36	40
100	0	0	2	4	9	13	18	22	27	31	36	40	44

11.4.30 The displacement resultant mortality estimates for Thanet Extension and a 1 km distance around it can be summed to give a project alone 1% and 5% resultant mortality estimate of zero and two respectively.

11.4.31 The mean peak numbers in the autumn migration and winter periods were lower (with none in the breeding season) and these can be added to the peak seasonal numbers for the spring migration period described above to produce an annual total. Collectively, the total number of potentially displaced razorbills within all periods (in this case the migration-spring, migration-autumn and wintering periods only) and across both the Thanet Extension site and a 1 km buffer would be 73 individuals. The estimated number of razorbills potentially subject to mortality per annum would therefore be between one and two individuals (this is based upon mortality rates of 1% or 5%).

11.4.32 None of the razorbill that was recorded within and around Thanet Extension can be directly attributed to the Flamborough and Filey Coast pSPA. It can be expected that outside the breeding season razorbill from the Flamborough and Filey Coast pSPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for razorbill (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 591,874 (Furness, 2015), of which 157,443 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Flamborough and Filey Coast pSPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 26,068 birds to the total (calculated on the basis of an SPA population 10,570 pairs x 2 plus 0.75 immatures per adult [from Furness, 2015] = 26,068). From these two population figures it can be determined that 18.5% of the total population in the UK waters of the North Sea can be attributed to the Flamborough and Filey Coast pSPA at any one time.

11.4.33 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis of between zero and two individuals. Two individuals represent 0.008% of the Flamborough and Filey Coast pSPA total population (adults plus immatures). Background annual survival of razorbill has been estimated as 0.900 (Robinson, 2017). On this basis 15,744 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 2,097 individuals out of the population of the Flamborough and Filey Coast pSPA. The two individuals identified above as being the prediction for displacement 5% resultant mortality from the construction of Thanet Extension is a 0.10% increase in background mortality of the Flamborough and Filey Coast pSPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the razorbill population of the Flamborough and Filey Coast pSPA.

11.4.34 As part of the consideration of the potential for AEoI, account has also to be taken of the fact that construction works are temporary and localised in nature.

11.4.35 There is, therefore, no potential for AEoI to the razorbill feature of the Flamborough and Filey Coast pSPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, razorbill will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

- 11.4.36 The components of the breeding seabird assemblage that were screened in for assessment were guillemot and razorbill. The detailed quantitative assessment of these two species above has identified no potential for AEol.
- 11.4.37 There is, therefore, no potential for AEol to the breeding seabird assemblage feature of the Flamborough and Filey Coast pSPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Northumberland Marine SPA - Guillemot

- 11.4.38 The nature of the construction activities; the sensitivity of guillemot to human activities; the guillemot density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are eight and 40 respectively. What differs is the proportion that these estimates represent of this particular SPA population.
- 11.4.39 None of the guillemot that was recorded within and around Thanet Extension can be directly attributed to the Northumberland Marine SPA. It can be expected that outside the breeding season guillemot from the Northumberland Marine SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Northumberland Marine SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 90,080 birds to the total (calculated on the basis of an SPA population 32,876 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 90,080). From these two population figures it can be determined that 5.9% of the total population in the UK waters of the North Sea can be attributed to the Northumberland Marine SPA at any one time.

- 11.4.40 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis between eight and 40 individuals. Forty individuals represent 0.044% of the Northumberland Marine SPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 4,864 individuals out of the population of the Northumberland Marine SPA. The 40 individuals identified above as being the prediction for displacement 5% resultant mortality from the construction of Thanet Extension is a 0.82% increase in background mortality of the Northumberland Marine SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the Northumberland Marine SPA.

- 11.4.41 As part of the consideration of the potential for AEol, account has also to be taken of the fact that construction works are temporary and localised in nature.

- 11.4.42 There is, therefore, no potential for AEol to the guillemot feature of the Northumberland Marine SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

- 11.4.43 The component of the breeding seabird assemblage that was screened in for assessment was guillemot. The detailed quantitative assessment for this species above has identified no potential for AEol.
- 11.4.44 There is, therefore, no potential for AEol to the breeding seabird assemblage feature of the Northumberland Marine SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Farne Islands SPA - Guillemot

- 11.4.45 The nature of the construction activities; the sensitivity of guillemot to human activities; the guillemot density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km buffer around it at 1% and 5% resultant mortality are eight and 40 respectively. What differs is the proportion that these estimates represent of this particular SPA population.

- 11.4.46 None of the guillemot that was recorded within and around Thanet extension can be directly attributed to the Farne Islands SPA. It can be expected that outside the breeding season guillemot from the Farne Islands SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Farne Islands SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 90,078 birds to the total (calculated on the basis of an SPA population 32,875 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 90,078). From these two population figures it can be determined that 5.9% of the total population in the UK waters of the North Sea can be attributed to the Farne Islands SPA at any one time.
- 11.4.47 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis of between eight and 40 individuals. Forty individuals represent 0.044% of the Farne Islands SPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 4,864 individuals out of the population of the Farne Islands SPA. The 40 individuals identified above as being the prediction for displacement 5% resultant mortality from the construction of Thanet Extension is a 0.82% increase in background mortality of the Farne Islands SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the Farne Islands SPA.
- 11.4.48 As part of the consideration of the potential for AEoI, account has also to be taken of the fact that construction works are temporary and localised in nature.
- 11.4.49 There is, therefore, no potential for AEoI to the guillemot feature of the Farne Islands SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

- 11.4.50 The component of the breeding seabird assemblage that was screened in for assessment was guillemot. The detailed quantitative assessment for this species above has identified no potential for AEoI.
- 11.4.51 There is, therefore, no potential for AEoI to the breeding seabird assemblage feature of the Farne Islands SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

St Abb's Head to Fast Castle SPA - Guillemot

- 11.4.52 The nature of the construction activities; the sensitivity of guillemot to human activities; the guillemot density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are eight and 40 respectively. What differs is the proportion that these estimates represent of this particular SPA population.
- 11.4.53 None of the guillemot that was recorded within and around Thanet Extension can be directly attributed to the St Abb's Head to Fast Castle SPA. It can be expected that outside the breeding season guillemot from the St Abb's Head to Fast Castle SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the St Abb's Head to Fast Castle SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 85,762 birds to the total (calculated on the basis of an SPA population 31,300 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 85,762). From these two population figures it can be determined that 5.6% of the total population in the UK waters of the North Sea can be attributed to the St Abb's Head to Fast Castle SPA at any one time.
- 11.4.54 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis of between eight and 40 individuals. Forty individuals represent 0.046% of the St Abb's Head to Fast Castle SPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 4,631 individuals out of the population of the St Abb's Head to Fast Castle SPA. The 40 individuals identified above as being the prediction for displacement resultant mortality from the construction of Thanet Extension is a 0.86% increase in background mortality of the St Abb's Head to Fast Castle SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the St Abb's Head to Fast Castle SPA.
- 11.4.55 As part of the consideration of the potential for AEoI, account has also to be taken of the fact that construction works are temporary and localised in nature.
- 11.4.56 There is, therefore, no potential for AEoI to the guillemot feature of the St Abb's Head to Fast Castle SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

St Abb's Head to Fast Castle SPA - Razorbill

- 11.4.57 The nature of the construction activities; the sensitivity of razorbill to human activities; the razorbill density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are zero and two respectively. What differs is the proportion that these estimates represent of this particular SPA population.
- 11.4.58 None of the razorbill that was recorded within and around Thanet Extension can be directly attributed to the St Abb's Head to Fast Castle SPA. It can be expected that outside the breeding season razorbill from the St Abb's Head to Fast Castle SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for razorbill (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 591,874 (Furness, 2015), of which 157,443 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the St Abb's Head to Fast Castle SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 5,995 birds to the total (calculated on the basis of an SPA population 2,180 pairs x 2 plus 0.75 immatures per adult [from Furness, 2015] = 5,995). From these two population figures it can be determined that 3.8% of the total population in the UK waters of the North Sea can be attributed to the St Abb's Head to Fast Castle SPA at any one time.
- 11.4.59 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis of between zero and two individuals. Two individuals represent 0.033% of the St Abb's Head to Fast Castle SPA total population (adults plus immatures). Background annual survival of razorbill has been estimated as 0.900 (Robinson, 2017). On this basis 15,744 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 600 individuals out of the population of the St Abb's Head to Fast Castle SPA. The two individuals identified above as being the prediction for displacement 5% resultant mortality from the construction of Thanet Extension is a 0.33% increase in background mortality of the St Abb's Head to Fast Castle SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the razorbill population of the St Abb's Head to Fast Castle SPA.
- 11.4.60 As part of the consideration of the potential for AEol, account has also to be taken of the fact that construction works are temporary and localised in nature.
- 11.4.61 There is, therefore, no potential for AEol to the razorbill feature of the St Abb's Head to Fast Castle SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, razorbill will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

- 11.4.62 The components of the breeding seabird assemblage that were screened in for assessment were guillemot and razorbill. The detailed quantitative assessment of these two species above has identified no potential for AEol.
- 11.4.63 There is, therefore, no potential for AEol to the breeding seabird assemblage feature of the St Abb's Head to Fast Castle SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

*Operations and Maintenance**Disturbance and Displacement*

- 11.4.64 The potential for disturbance and displacement to result in an AEol relates to the following designated sites and the relevant features:
- Outer Thames Estuary SPA; red-throated diver;
 - Flamborough and Filey Coast pSPA; guillemot and razorbill;
 - Northumberland Marine SPA; guillemot;
 - Farne Islands SPA; guillemot;
 - St Abb's Head to Fast Castle SPA; guillemot and razorbill.
- 11.4.65 The O&M phase has the potential to affect birds in the marine environment through disturbance due to the physical presence of the WTGs and the activities that occur to maintain those WTGs with related vessel and helicopter movements. The disturbance created has the potential to result in displacement of birds from the site of WTG operation, from a distance around it and from routes used by vessels to access the operational site. This displacement would effectively result in habitat loss through a reduction in the area available to birds for feeding, resting and moulting. Information on studies that have examined the extent of displacement has already been given in the introductory section on disturbance and displacement during the construction phase.
- Outer Thames Estuary SPA - Red-throated Diver*
- 11.4.66 Red-throated diver has been identified as being particularly sensitive to human activities in marine areas, including through the disturbance effects of ship and helicopter traffic (Garthe and Hüppop, 2004, Schwemmer *et al.*, 2011, Furness and Wade, 2012, Wade *et al.*, 2016; SNCBs, 2017).

11.4.67 During the operational phase red-throated divers may be subject to potential disturbance and displacement from Thanet Extension due to activities associated with the maintenance of WTGs (vessel movements in and out of the site) as well as the presence of the operating WTGs. The evidence from the TOWF post-construction (i.e. operation) monitoring surveys is that displacement of red-throated divers within the site was 73% (Royal HaskoningDHV, 2013). The monitoring of other constructed OWFs in and around the Outer Thames Estuary has identified that the degree of displacement from within a wind farm is very high (as it has also been shown to be on the European side of the North Sea). Accordingly, a more precautionary 100% displacement is applied within the footprint of Thanet Extension in the operational phase. Beyond the TOWF site boundary there was no displacement identified (Royal HaskoningDHV, 2013). Accounting for this locally derived site based evidence, any potential displacement effects are predicted to be limited to within a sphere of influence within Thanet Extension and not to extend into an area around.

11.4.68 The peak seasonal density recorded (from which peak seasonal abundance can be derived) was during the winter period when red-throated divers were present in Thanet Extension with a mean density of 2.66 birds/ km² or an abundance of 194 individuals. If a 100% displacement rate is applied to the winter red-throated diver population within Thanet Extension then an estimated 194 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of red-throated divers potentially subject to mortality is between two and 10 individuals. The displacement matrix for a population of 194 red-throated divers is presented in Table 11.11.

Table 11.11: Displacement matrix presenting the number of red-throated divers in the Thanet Extension site only, during the winter bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	1	2	2	2
10	0	0	1	2	4	6	8	10	12	14	16	17	19
20	0	0	2	4	8	12	16	19	23	27	31	35	39
30	0	1	3	6	12	17	23	29	35	41	47	52	58
40	0	1	4	8	16	23	31	39	47	54	62	70	78
50	0	1	5	10	19	29	39	49	58	68	78	87	97
60	0	1	6	12	23	35	47	58	70	81	93	105	116
70	0	1	7	14	27	41	54	68	81	95	109	122	136
80	0	2	8	16	31	47	62	78	93	109	124	140	155
90	0	2	9	17	35	52	70	87	105	122	140	157	175
100	0	2	10	19	39	58	78	97	116	136	155	175	194

11.4.69 The peak seasonal density recorded is the spring migration period when red-throated divers were present in the Thanet Extension site with a mean peak density of 0.60 birds/ km² or an abundance of 44 individuals. If a 100% displacement rate is applied to the spring migration red-throated diver population within the Thanet Extension site then an estimated 44 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of red-throated divers potentially subject to mortality is between zero and two individuals. The displacement matrix for a population of 44 red-throated divers is presented in Table 11.12.

11.4.70 When the two seasons are combined when red-throated diver are present (winter and spring migration) the collective total is 238 individuals.

Table 11.12: Displacement matrix presenting the number of red-throated divers in the Thanet Extension site only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	2	2	3	3	4	4	4
20	0	0	0	1	2	3	4	4	5	6	7	8	9
30	0	0	1	1	3	4	5	7	8	9	11	12	13
40	0	0	1	2	4	5	7	9	11	12	14	16	18
50	0	0	1	2	4	7	9	11	13	15	18	20	22
60	0	0	1	3	5	8	11	13	16	18	21	24	26
70	0	0	2	3	6	9	12	15	18	22	25	28	31
80	0	0	2	4	7	11	14	18	21	25	28	32	35
90	0	0	2	4	8	12	16	20	24	28	32	36	40
100	0	0	2	4	9	13	18	22	26	31	35	40	44

11.4.71 None of these red-throated diver that were recorded within Thanet Extension can be directly attributed to the Outer Thames Estuary SPA population as none were recorded within that SPA (the areas of Thanet Extension and the SPA being mutually exclusive). It can be expected though that red-throated diver are mobile across the general area and that birds that occur at any one time outside the SPA might occur within it at another time. The population estimate for the wider Thames Estuary area from which the Outer Thames Estuary SPA was derived was 8,132 birds (O'Brien *et al.*, 2012). From the same population distribution data the boundary of the Outer Thames Estuary SPA was defined and identified as including 6,466 individuals. From these two population figures it can be determined that 79.5% of the total population can be attributed to the Outer Thames Estuary SPA at any one time. This value can also be used to attribute the proportion of the birds using Thanet Extension that might, given regular mixing of the population between areas within and outside the SPA, be associated with the SPA. The combined peak seasonal abundance recorded was 238 individuals, from which 189 could be attributed to the SPA on this basis. Even if all these birds were subject to mortality as a result of disturbance and displacement this would represent 2.9% of the population of the Outer Thames Estuary SPA. As described above, displacement resultant mortality is predicted to be in the range of 1 - 5% with a resultant mortality prediction for the 189 birds attributed to the SPA of between two and nine individuals. Nine individuals represent 0.15% of the Outer Thames Estuary SPA population. Background annual survival of red-throated diver has been estimated as 0.84 (Robinson, 2017). On this basis 1,035 individuals out of the population of the Outer Thames Estuary SPA might be expected to die each year. The nine individuals identified above as being the prediction for displacement resultant mortality from the O&M of Thanet Extension is a 0.87% increase in background mortality. This very small increase in mortality makes no material difference to the long-term maintenance of the red-throated diver population of the Outer Thames Estuary SPA.

11.4.72 There is, therefore, no potential for AEol to the red-throated diver feature of the Outer Thames Estuary SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, red-throated diver will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Flamborough and Filey Coast pSPA - Guillemot

11.4.73 Guillemots are considered to have Low to Medium general sensitivity to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Furness and Wade (2012), Wade *et al.* (2016) and the SNCB guidance (SNCBs, 2017).

11.4.74 During the O&M phase guillemots may be subject to potential disturbance and displacement from Thanet Extension and potentially around it due to the presence of the WTGs and activities associated with the maintenance of the WTGs (vessel movements in and out of the site). The evidence from the TOWF post-construction monitoring surveys is that displacement of guillemots within the site was 79% and beyond the site boundary up to 23% displacement within a 1 km distance around it occurred (Royal HaskoningDHV, 2013). This local site based evidence is applied and any potential effects are predicted to be limited to within a sphere of influence within Thanet Extension and a 1 km distance around it only. This local site based evidence has been rounded up on a precautionary basis to the 5% category value of 80% for within the site and 25% within a 1 km distance around it (this rounding is for the purposes of the application of a numeric value in the displacement matrices).

11.4.75 Guillemot numbers peaked in the spring migration period in Thanet Extension with a mean peak density of 8.26 birds/km² and a mean peak abundance estimate of 602 individuals. Within the 4 km survey distance around Thanet Extension numbers also peaked in the spring migration period with a mean peak density of 5.39 birds/km² and an abundance estimate of 1,142 individuals.

11.4.76 If an 80% displacement rate is applied to the spring migration mean peak estimate of 602 within Thanet Extension then an estimated 482 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of guillemots potentially subject to mortality is between five and 24 individuals. The displacement matrix for a population of 602 guillemots is presented in Table 11.13.

Table 11.13: Displacement matrix presenting the number of guillemots in the Thanet Extension site only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	2	2	3	4	4	5	5	6
10	0	1	3	6	12	18	24	30	36	42	48	54	60
20	0	1	6	12	24	36	48	60	72	84	96	108	120
30	0	2	9	18	36	54	72	90	108	126	144	163	181
40	0	2	12	24	48	72	96	120	144	169	193	217	241
50	0	3	15	30	60	90	120	151	181	211	241	271	301
60	0	4	18	36	72	108	144	181	217	253	289	325	361
70	0	4	21	42	84	126	169	211	253	295	337	379	421
80	0	5	24	48	96	144	193	241	289	337	385	433	482
90	0	5	27	54	108	163	217	271	325	379	433	488	542
100	0	6	30	60	120	181	241	301	361	421	482	542	602

11.4.77 If a 25% displacement rate is applied to the spring migration peak estimate of 235 within the 1 km distance around Thanet Extension then an estimated 80 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of guillemots potentially subject to mortality is between one and four individuals. The displacement matrix for a population of 235 guillemots is presented in Table 11.14.

Table 11.14: Displacement matrix presenting the number of guillemots in the 1 km Buffer only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	2	2	2	2
10	0	0	1	2	5	7	9	12	14	16	19	21	23
20	0	0	2	5	9	14	19	23	28	33	38	42	47
25	0	1	3	6	12	18	23	29	35	41	47	53	59
30	0	1	4	7	14	21	28	35	42	49	56	63	70
40	0	1	5	9	19	28	38	47	56	66	75	84	94
50	0	1	6	12	23	35	47	59	70	82	94	106	117
60	0	1	7	14	28	42	56	70	84	99	113	127	141
70	0	2	8	16	33	49	66	82	99	115	131	148	164
80	0	2	9	19	38	56	75	94	113	131	150	169	188
90	0	2	11	21	42	63	84	106	127	148	169	190	211
100	0	2	12	23	47	70	94	117	141	164	188	211	235

11.4.78 The mean peak numbers in the breeding season, autumn migration and winter periods were considerably lower and these can be added to the peak seasonal numbers for the spring migration period described above to produce an annual total. Collectively, the total number of potentially displaced guillemots on an annual basis (in this case all four seasons) would be 986 individuals within the Thanet Extension site and 449 in a 1 km buffer surrounding Thanet Extension. If 80% and 25% displacement rates are applied to these annual totals created by summing across the seasons to the Thanet Extension site and the 1 km buffer respectively, then an estimated 789 and 112 individuals, or 901 in total, may be subject to potential displacement. The estimated number of guillemots potentially subject to mortality per annum would therefore be between nine and 45 individuals (this is based upon mortality rates of 1% or 5%).

11.4.79 None of the guillemots that were recorded within and around Thanet extension can be directly attributed to the Flamborough and Filey Coast pSPA. It can be expected that outside the breeding season guillemot from the Flamborough and Filey Coast pSPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Flamborough and Filey Coast pSPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 114,003 birds to the total (calculated on the basis of an SPA population 41,607 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 114,003). From these two population figures it can be determined that 7.5% of the total population in the UK waters of the North Sea can be attributed to the Flamborough and Filey Coast pSPA at any one time.

11.4.80 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction on an annual basis (recognising that this is precautionary as that any total includes breeding season birds which clearly cannot be attributed to the pSPA) of between nine and 45 individuals. Forty five individuals represent 0.039% of the Flamborough and Filey Coast pSPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 6,156 individuals out of the population of the Flamborough and Filey Coast pSPA. The 45 individuals identified above as being the prediction for displacement 5% resultant mortality from the O&M of Thanet Extension is a 0.73% increase in background mortality of the Flamborough and Filey Coast pSPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the Flamborough and Filey Coast pSPA.

11.4.81 There is, therefore, no potential for AEoI to the guillemot feature of the Flamborough and Filey Coast pSPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Flamborough and Filey Coast pSPA - Razorbill

11.4.82 Razorbills are considered to have Medium general sensitivity to disturbance and displacement, based on their sensitivity to ship and helicopter traffic in Garthe and Hüppop (2004), Furness and Wade (2012), Wade *et al.* (2016) and the SNCB guidance (SNCBs, 2017).

11.4.83 During the O&M phase razorbills may be subject to potential disturbance and displacement from Thanet Extension and potentially around it due to the presence of the WTGs and activities associated with the maintenance of the WTGs (vessel movements in and out of the site). The evidence from the TOWF post-construction monitoring surveys is that displacement of razorbills within the site was 95% and beyond the site boundary up to possibly 25% (but not significant) displacement within a 1 km distance around it occurred (Royal HaskoningDHV, 2013). This local site based evidence is applied and any potential effects are predicted to be limited to within a sphere of influence within Thanet Extension and a 1 km distance around it only. This local site based evidence has been rounded up on a precautionary basis to the 5% category value of 95% for within the site and 25% within a 1 km distance around it (this rounding is for the purposes of the application of a numeric value in the displacement matrices).

11.4.84 Razorbills were recorded within the Thanet Extension site predominantly during the migration-spring and winter periods with mean peak estimates of 29 and 28 individuals, respectively (or densities of 0.40 and 0.38 birds/ km²). Razorbills were also recorded within the 4 km buffer, mostly during the migration-spring period, but also the migration autumn and winter periods, with mean peak estimates of 215, 52 and 71 individuals, respectively (or densities of 1.02, 0.25 and 0.33 birds/ km²).

11.4.85 If a 95% displacement rate is applied to the spring migration mean peak estimate of 29 within Thanet Extension then an estimated 28 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of razorbills potentially subject to mortality is between zero and one individual. The displacement matrix for a population of 61 razorbills is presented below:

Table 11.15: Displacement matrix presenting the number of razorbills in the Thanet Extension site only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	1	1	2	2	2	3	3
20	0	0	0	1	1	2	2	3	3	4	5	5	6
30	0	0	0	1	2	3	3	4	5	6	7	8	9
40	0	0	1	1	2	3	5	6	7	8	9	10	12
50	0	0	1	1	3	4	6	7	9	10	12	13	15
60	0	0	1	2	3	5	7	9	10	12	14	16	17
70	0	0	1	2	4	6	8	10	12	14	16	18	20
80	0	0	1	2	5	7	9	12	14	16	19	21	23
90	0	0	1	3	5	8	10	13	16	18	21	23	26
95	0	0	1	3	6	8	11	14	17	19	22	25	28
100	0	0	1	3	6	9	12	15	17	20	23	26	29

11.4.86 If a 25% displacement rate is applied to the spring migration peak estimate of 44 within the 1 km distance around Thanet Extension then an estimated 11 individuals may be subject to potential displacement. If this number of displaced birds were subject to mortality rates of 1% or 5% then the estimated number of razorbills potentially subject to mortality is between zero and one individual. The displacement matrix for a population of 44 razorbills is presented in Table 11.16.

Table 11.16: Displacement matrix presenting the number of razorbills in the 1 km Buffer only, during the spring migration bio-season that may be subject to displacement (highlighted in green) or mortality (highlighted in pink)

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	2	2	3	3	4	4	4
20	0	0	0	1	2	3	4	4	5	6	7	8	9
25	0	0	1	1	2	3	4	6	7	8	9	10	11
30	0	0	1	1	3	4	5	7	8	9	11	12	13
40	0	0	1	2	4	5	7	9	11	12	14	16	18
50	0	0	1	2	4	7	9	11	13	16	18	20	22
60	0	0	1	3	5	8	11	13	16	19	21	24	27
70	0	0	2	3	6	9	12	16	19	22	25	28	31
80	0	0	2	4	7	11	14	18	21	25	28	32	36
90	0	0	2	4	8	12	16	20	24	28	32	36	40
95	0	0	2	4	8	13	17	21	25	30	34	38	42
100	0	0	2	4	9	13	18	22	27	31	36	40	44

11.4.87 The mean peak numbers in the autumn migration and winter periods were lower (with none in the breeding season) and these can be added to the peak seasonal numbers for the spring migration period described above to produce an annual total. Collectively, the total number of potentially displaced razorbills within all periods (in this case the migration-spring, migration-autumn and wintering periods only) and across both the Thanet Extension site and a 1 km buffer would be 73 individuals. The estimated number of razorbills potentially subject to mortality per annum would therefore be between one and two individuals (this is based upon mortality rates of 1% or 5%).

11.4.88 None of the razorbill that was recorded within and around Thanet Extension can be directly attributed to the Flamborough and Filey Coast pSPA. It can be expected that outside the breeding season razorbill from the Flamborough and Filey Coast pSPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for razorbill (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 591,874 (Furness, 2015), of which 157,443 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Flamborough and Filey Coast pSPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 26,068 birds to the total (calculated on the basis of an SPA population 10,570 pairs x 2 plus 0.75 immatures per adult [from Furness, 2015] = 26,068). From these two population figures it can be determined that 18.5% of the total population in the UK waters of the North Sea can be attributed to the Flamborough and Filey Coast pSPA at any one time.

11.4.89 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction between one and two individuals. Two individuals represent 0.008% of the Flamborough and Filey Coast pSPA total population (adults plus immatures). Background annual survival of razorbill has been estimated as 0.900 (Robinson, 2017). On this basis 15,744 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 2,907 individuals out of the population of the Flamborough and Filey Coast pSPA. The two individuals identified above as being the prediction for displacement 5% resultant mortality from the O&M of Thanet Extension is a 0.07% increase in background mortality of the Flamborough and Filey Coast pSPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the razorbill population of the Flamborough and Filey Coast pSPA.

11.4.90 There is, therefore, no potential for AEoI to the razorbill feature of the Flamborough and Filey Coast pSPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, razorbill will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

11.4.91 The components of the breeding seabird assemblage that were screened in for assessment were guillemot and razorbill. The detailed quantitative assessment of these two species above has identified no potential for AEoI.

11.4.92 There is, therefore, no potential for AEoI to the breeding seabird assemblage feature of the Flamborough and Filey Coast pSPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Northumberland Marine SPA - Guillemot

11.4.93 The nature of the O&M activities; the sensitivity of guillemot to human activities; the guillemot density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are nine and 45 respectively. What differs is the proportion that these estimates represent of this particular SPA population.

- 11.4.94 None of the guillemot that was recorded within and around Thanet extension can be directly attributed to the Northumberland Marine SPA. It can be expected that outside the breeding season guillemot from the Northumberland Marine SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Northumberland Marine SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 90,080 birds to the total (calculated on the basis of an SPA population 32,876 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 90,080). From these two population figures it can be determined that 5.9% of the total population in the UK waters of the North Sea can be attributed to the Northumberland Marine SPA at any one time.
- 11.4.95 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction between nine and 45 individuals. Forty five individuals represent 0.050% of the Northumberland Marine SPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 4,864 individuals out of the population of the Northumberland Marine SPA. The 45 individuals identified above as being the prediction for displacement 5% resultant mortality from the O&M of Thanet Extension is a 0.92% increase in background mortality of the Northumberland Marine SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the Northumberland Marine SPA.
- 11.4.96 There is, therefore, no potential for AEol to the guillemot feature of the Northumberland Marine SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

- 11.4.97 The component of the breeding seabird assemblage that was screened in for assessment was guillemot. The detailed quantitative assessment for this species above has identified no potential for AEol.
- 11.4.98 There is, therefore, no potential for AEol to the breeding seabird assemblage feature of the Northumberland Marine SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Farne Islands SPA - Guillemot

- 11.4.99 The nature of the O&M activities; the sensitivity of guillemot to human activities; the guillemot density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are nine and 45 respectively. What differs is the proportion that these estimates represent of this particular SPA population.
- 11.4.100 None of the guillemot that was recorded within and around Thanet Extension can be directly attributed to the Farne Islands SPA. It can be expected that outside the breeding season guillemot from the Farne Islands SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the Farne Islands SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 90,078 birds to the total (calculated on the basis of an SPA population 32,875 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 90,078). From these two population figures it can be determined that 5.9% of the total population in the UK waters of the North Sea can be attributed to the Farne Islands SPA at any one time.
- 11.4.101 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction between nine and 45 individuals. Forty five individuals represent 0.050% of the Farne Islands SPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 4,864 individuals out of the population of the Farne Islands SPA. The 45 individuals identified above as being the prediction for displacement 5% resultant mortality from the O&M of Thanet Extension is a 0.92% increase in background mortality of the Farne Islands SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the Farne Islands SPA.
- 11.4.102 There is, therefore, no potential for AEol to the guillemot feature of the Farne Islands SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

11.4.103 The component of the breeding seabird assemblage that was screened in for assessment was guillemot. The detailed quantitative assessment for this species above has identified no potential for AEol.

11.4.104 There is, therefore, no potential for AEol to the breeding seabird assemblage feature of the Farne Islands SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

St Abb's Head to Fast Castle SPA - Guillemot

11.4.105 The nature of the O&M activities; the sensitivity of guillemot to human activities; the guillemot density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are nine and 45 respectively. What differs is the proportion that these estimates represent of this particular SPA population.

11.4.106 None of the guillemot that was recorded within and around Thanet Extension can be directly attributed to the St Abb's Head to Fast Castle SPA. It can be expected that outside the breeding season guillemot from the St Abb's Head to Fast Castle SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for guillemot (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 1,617,306 (Furness, 2015), of which 1,523,146 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the St Abb's Head to Fast Castle SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 85,762 birds to the total (calculated on the basis of an SPA population 31,300 pairs x 2 plus 0.74 immatures per adult [from Furness, 2015] = 85,762). From these two population figures it can be determined that 5.6% of the total population in the UK waters of the North Sea can be attributed to the St Abb's Head to Fast Castle SPA at any one time.

11.4.107 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction between nine and 45 individuals. Forty five individuals represent 0.052% of the St Abb's Head to Fast Castle SPA total population (adults plus immatures). Background annual survival of guillemot has been estimated as 0.946 (Robinson, 2017). On this basis 82,250 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 4,631 individuals out of the population of the St Abb's Head to Fast Castle SPA. The 45 individuals identified above as being the prediction for displacement resultant mortality from the O&M of Thanet Extension is a 0.97% increase in background mortality of the St Abb's Head to Fast Castle SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the guillemot population of the St Abb's Head to Fast Castle SPA.

11.4.108 There is, therefore, no potential for AEol to the guillemot feature of the St Abb's Head to Fast Castle SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, guillemot will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

St Abb's Head to Fast Castle SPA - Razorbill

11.4.109 The nature of the O&M activities; the sensitivity of razorbill to human activities; the razorbill density and abundance in and around Thanet Extension; the predictions for the number displaced; and the predictions for the resultant mortality (identified in a matrix) have already been set out under the text for the Flamborough and Filey Coast pSPA and apply equally to this SPA. The displacement resultant mortality estimates on an annual basis for Thanet Extension and a 1 km distance around it at 1% and 5% resultant mortality are one and two individuals respectively. What differs is the proportion that these estimates represent of this particular SPA population.

11.4.110 None of the razorbill that was recorded within and around Thanet Extension can be directly attributed to the St Abb's Head to Fast Castle SPA. It can be expected that outside the breeding season razorbill from the St Abb's Head to Fast Castle SPA will disperse widely away from the breeding site, mixing with birds originating from other breeding colonies. The population estimate for razorbill (adults plus immatures) in the UK waters of the North Sea outside of the breeding season is 591,874 (Furness, 2015), of which 157,443 are considered to be UK birds. If it is assumed, this being the precautionary assumption, that all birds from the St Abb's Head to Fast Castle SPA remain in the UK waters of the North Sea outside the breeding season, then they will contribute 5,995 birds to the total (calculated on the basis of an SPA population 2,180 pairs x 2 plus 0.75 immatures per adult [from Furness, 2015] = 5,995). From these two population figures it can be determined that 3.8% of the total population in the UK waters of the North Sea can be attributed to the St Abb's Head to Fast Castle SPA at any one time.

11.4.111 Displacement resultant mortality is predicted to be in the range of 1% to 5% with a resultant mortality prediction between one and two individuals. Two individuals represent 0.033% of the St Abb's Head to Fast Castle SPA total population (adults plus immatures). Background annual survival of razorbill has been estimated as 0.900 (Robinson, 2017). On this basis 15,744 individuals out of the population of the UK waters of the North Sea might be expected to die each year and 600 individuals out of the population of the St Abb's Head to Fast Castle SPA. The two individuals identified above as being the prediction for displacement 5% resultant mortality from the O&M of Thanet Extension is a 0.33% increase in background mortality of the St Abb's Head to Fast Castle SPA population. This very small increase in mortality makes no material difference to the long-term maintenance of the razorbill population of the St Abb's Head to Fast Castle SPA.

11.4.112 There is, therefore, no potential for AEoI to the razorbill feature of the St Abb's Head to Fast Castle SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, razorbill will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Breeding seabird assemblage

11.4.113 The components of the breeding seabird assemblage that were screened in for assessment were guillemot and razorbill. The detailed quantitative assessment of these two species above has identified no potential for AEoI.

11.4.114 There is, therefore, no potential for AEoI to the breeding seabird assemblage feature of the St Abb's Head to Fast Castle SPA in relation to disturbance and displacement effects from Thanet Extension alone and therefore, subject to natural change, the breeding seabird assemblage will be maintained as a feature in the long-term with respect to the potential for adverse effects from disturbance and displacement.

Collision Risk

11.4.115 The potential for mortality resultant from collision risk to result in an AEoI relates to the following designated sites and the relevant features:

- Outer Thames Estuary SPA; common tern and little tern;
- Flamborough and Filey Coast pSPA; gannet and kittiwake;
- Foulness (Mid-Essex Coast Phase 5) SPA; Sandwich tern;
- Alde-Ore Estuary SPA; lesser black-backed gull;
- Alde-Ore Estuary Ramsar; lesser black-backed gull;
- Flamborough Head and Bempton Cliffs SPA; kittiwake; and
- St Abb's Head to Fast Castle SPA; kittiwake.

11.4.116 There is a potential collision risk to birds which fly through the proposed development site whilst foraging for food, commuting between breeding sites and foraging areas, or when on migration. The risk to birds arises from colliding with the WTG rotors and associated infrastructure resulting in injury or fatality.

11.4.117 CRM has been used to estimate the potential risk to birds associated with the proposed development. The approach to CRM is presented in Volume 4, Annex 4-4 to the ES and provides the methods, data input and results of the CRM. Modelling has been carried out using the Band (2012) model applied in Microsoft Excel to the density of flying birds measured by 24 months of aerial survey to produce predictions of mortality for particular species across set time periods (biological seasons) and on an annual basis. This most recent version of the Band model has been designed specifically for application to OWF developments.

11.4.118 CRM accounts for a number of different species-specific behavioural aspects of birds being assessed, including the height at which birds fly, their ability to avoid moving or static structures and how active they are diurnally and nocturnally, respectively. Details of these considerations are provided in in Volume 4, Annex 4-4.

11.4.119 The collision predictions included in this assessment present the results that have been output from a specific set of model runs. This is Band CRM Option 2 incorporating the bird flight height information drawn from the BTO SOSS-02 report (Cook et al, 2012) that sets out the percentage at potential collision height (PCH) for each seabird species determined from a large number of surveys carried out in UK waters. The avoidance rates applicable to Band CRM Option 2 (Cook et al, 2014) have been used, updated where relevant to account for the SNCB review of those avoidance rates ((JNCC et al, 2014). The outputs from the application of alternative model options, PCH determined from other survey data sets and a range of values around the mean values for some factors the annual collision estimates are presented from the maximum likelihood mean density outputs with corresponding lower and upper confidence interval values are included in Volume 4, Annex 4-4 to the ES.

11.4.120 It should be recognised that the collision estimates provided by the modelling are expected to be an overestimate of annual mortality rates, that is they are a precautionary assessment. This is the result of a number of factors, including:

- Modelling using the worst-case turbine array with respect to collision risk (a development of 34 10 MW WTGs);
- Assuming a continuous flux of birds through the Thanet Extension site at a rate resulting from the mean peak density for the relevant bio-season being applied on all days in that bio-season;
- Assuming that flying birds encounter all WTGs within the Thanet Extension site and the level of activity remains constant regardless of losses; and

- Assuming each bird crosses through the longest possible trajectory in a straight line through the Thanet Extension site.

Outer Thames Estuary SPA - Common tern

11.4.121 Common tern was added as an interest feature to the Outer Thames Estuary SPA in autumn 2017. As a result it was not included in the screening for LSE presented in the HRA Screening Report (Annex 1 to this report) and it was not considered in the collision risk modelling presented in the PEIR. Common tern was screened in on a precautionary basis for collision risk pending a more detailed consideration of the potential for LSE.

11.4.122 The Outer Thames Estuary SPA has common tern as an interest feature in order to provide protection for the population while foraging in coastal and marine waters in association with its nesting colony SPAs on the Suffolk and Essex coasts. The nearest of those colonies is at New England Creek within the Foulness SPA that is 46 km distant from the array. This is beyond the mean maximum foraging range of 15.2 km +/- 11.2 km (Thaxter et al., 2012) and as a result the potential for collision risk in the breeding season has been screened out (section 7). Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded 'commic' tern (that on a precautionary basis can all be ascribed to common tern) on two occasions (counts of 2 in April 2016 and 17 in May 2017) in the 4 km buffer and not at all in Thanet Extension or TOWF. Terns on passage to a breeding colony on the Suffolk or Essex coast would only pass the region of Thanet Extension once in spring and once in autumn and as a result the risks of collision are extremely low. Cook et al (2012) determined that 12.7% of common tern flights would be at PCH. Quantitative CRM is not justified for this species.

11.4.123 Given the very low numbers recorded, the very low number of potential passes across the region of Thanet Extension and the low flight height, the risk of collision is extremely low as is the potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.124 There is, therefore, no potential for AEol to the common tern feature of the Outer Thames Estuary SPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, common tern will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Little tern

11.4.125 Little tern was added as an interest feature to the Outer Thames Estuary SPA in autumn 2017. As a result it was not included in the screening for LSE presented in the HRA Screening Report (Annex 1 to this report) and it was not considered in the collision risk modelling presented in the PEI report. Little tern was screened in on a precautionary basis for collision risk pending a more detailed consideration of the potential for LSE.

11.4.126 The Outer Thames Estuary SPA has little tern as an interest feature in order to provide protection for the population while foraging in coastal waters in association with its nesting colony SPAs on the Suffolk and Essex coasts. The mean maximum foraging range is very short at 6.3 km +/- 2.4 km (Thaxter et al., 2012) and as a result the potential for collision risk in the breeding season has been screened out (section 7). Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey did not record little tern. Terns on passage to a breeding colony on the Suffolk or Essex coast would only pass the region of Thanet Extension once in spring and once in autumn and as a result the risks of collision are extremely low. Cook et al (2012) did not have sufficient data to analyse little tern flights, indicating how scarce is this species away from the coastal margin. Quantitative CRM is not justified for this species.

11.4.127 Given that none were recorded and the very low number of potential passes across the region of Thanet Extension, the risk of collision is extremely low as is the potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.128 There is, therefore, no potential for AEol to the little tern feature of the Outer Thames Estuary SPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, little tern will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Foulness (Mid-Essex Coast Phase 5) SPA - Sandwich tern

11.4.129 Sandwich tern was screened in on a precautionary basis for collision risk (Annex 1 to this report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.130 The Sandwich tern breeding colony in the Foulness (Mid-Essex Coast Phase 5) SPA is within mean maximum foraging range of 49 km +/- 7.1 km (Thaxter et al., 2012) of Thanet Extension, raising the potential of collision risk in the breeding season. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded Sandwich tern on three occasions, in all instances single birds in the 4 km buffer, in the months of March 2016, April 2016 and April 2017. Terns on passage to a breeding colony on the Essex coast would only pass the region of Thanet Extension once in spring and once in autumn and as a result the risks of collision are extremely low. Cook et al (2012) determined that 3.6% of Sandwich tern flights would be at PCH. Quantitative CRM is not justified for this species.

11.4.131 Given the very low numbers recorded, the very low number of potential passes across the region of Thanet Extension and the low flight height, the risk of collision is extremely low as is the potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.132 There is, therefore, no potential for AEoI to the Sandwich tern feature of the Foulness (Mid-Essex Coast Phase 5) SPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, Sandwich tern will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Alde-Ore Estuary SPA - lesser black-backed gull

11.4.133 Lesser black-backed gull was screened in on a precautionary basis for collision risk (Annex 1 to this report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.134 The lesser black-backed gull breeding population in the Alde-Ore Estuary SPA is within mean maximum foraging range of 141 km +/-50.8 km (Thaxter et al., 2012) of Thanet Extension, raising the potential of collision risk in the breeding season. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded lesser black-backed gulls in the Thanet Extension site in all four seasons, with the highest density of 0.58 birds/ km² recorded during the spring period. The majority of the lesser black-backed gulls from the aerial digital survey abundance estimates (75%) within the Thanet Extension site were sitting on the water and not in flight.

11.4.135 The CRM predicted an annual total of 2.35 lesser black-backed gull collisions, consisting of 1.52 in the breeding season, 0.44 in the spring, none in the autumn and 0.40 in the winter. The precautionary approach to assessing the significance of this predicted number of collisions in relation to the Alde-Ore Estuary SPA is to assume that all the collisions in the breeding season occur to adult birds that are part of the Alde-Ore Estuary SPA breeding population (outside of the breeding season the site population will mix with the North Sea population and/or migrate to waters further south meaning that in effect none of the predicted collisions can be attributed to the site). The SPA breeding population at classification was 14,070 pairs (28,140 breeding adults). An annual collision prediction of 1.52 birds is 0.005% of the SPA population. With a baseline mortality rate of 12.6%, the background mortality of the SPA breeding population is 3,546 birds. The predicted collisions are a 0.043% increase relative to the background levels, this is a negligible change. There is no potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.136 There is, therefore, no potential for AEoI to the lesser black-backed gull feature of the Alde-Ore Estuary SPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, lesser black-backed gull will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Alde-Ore Estuary Ramsar - lesser black-backed gull;

11.4.137 Lesser black-backed gull was screened in on a precautionary basis for collision risk (Annex 1 to this report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.138 The lesser black-backed breeding population in the Alde-Ore Estuary Ramsar site is within mean maximum foraging range of 141 km +/-50.8 km (Thaxter et al., 2012) of Thanet Extension, raising the potential of collision risk in the breeding season. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded lesser black-backed gulls in the Thanet Extension site in all four seasons, with the highest density of 0.58 birds/ km² recorded during the spring period. The majority of the lesser black-backed gulls from the aerial digital survey abundance estimates (75%) within the Thanet Extension site were sitting on the water and not in flight.

11.4.139 The CRM predicted an annual total of 2.35 lesser black-backed gull collisions, consisting of 1.52 in the breeding season, 0.44 in the spring, none in the autumn and 0.40 in the winter. The precautionary approach to assessing the significance of this predicted number of collisions in relation to the Alde-Ore Estuary Ramsar site is to assume that all the collisions in the breeding season occur to adult birds that are part of the Alde-Ore Estuary Ramsar site breeding population (outside of the breeding season the site population will mix with the North Sea population and/or migrate to waters further south meaning that in effect none of the predicted collisions can be attributed to the site). The Ramsar site breeding population at listing was 5,790 pairs (11,580 breeding adults). An annual collision prediction of 1.52 birds is 0.013% of the Ramsar site population. With a baseline mortality rate of 12.6%, the background mortality of the Ramsar site breeding population is 1,459 birds. The predicted collisions are a 0.104% increase relative to the background level, this is a negligible change. There is no potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.140 There is, therefore, no potential for AEoI to the lesser black-backed gull feature of the Alde-Ore Estuary Ramsar site in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, lesser black-backed gull will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Flamborough and Filey Coast pSPA - Gannet

11.4.141 Gannet was screened in on a precautionary basis for collision risk (Annex 1 to this report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.142 The gannet breeding colony in the Flamborough and Filey Coast pSPA is outside of the mean maximum foraging range of 229.4 +/- 124.3 km (Thaxter et al., 2012) of Thanet Extension. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded gannets as being present in the Thanet Extension site in spring and autumn with the highest mean peak abundance of 77 birds with a density of 1.06 birds / km² estimated during the spring. The majority of gannets from the aerial digital survey abundance estimates (62%) were in flight in the Thanet Extension site and 4 km buffer.

11.4.143 The CRM predicted an annual total of 13.55 gannet collisions, consisting of 9.10 in the spring, none in the breeding season and 4.45 in the autumn (there is no winter bio-season for gannet). With no collisions predicted in the breeding season, the assessment has to consider what proportion of those birds present in the southern North Sea outside the breeding season may be attributed to the Flamborough and Filey Coast pSPA population of 16,938 adult birds from amongst the larger population present. Furness (2015) provides the basis on which that apportioning can be made. Seventy percent of the pSPA population is present in the North Sea in the spring migration period and all are present in the autumn migration period. This means that in the spring migration period 4.8% of the birds present can be attributed to the pSPA (70% of 16,938 divided by spring BDMPS of 248,385) and in the autumn period 3.7% of the birds present can be attributed to the pSPA (100% of 16,938 divided by the autumn BDMPS of 456,298). Accordingly, the collision predictions for the proposed Thanet Extension attributed to the pSPA are 0.43 in spring and 0.17 in autumn. These predictions represent a 0.013% and 0.005% increase in mortality in spring and autumn respectively relative to the background levels, this is a negligible change. There is no potential for an adverse effect on the population and hence on the integrity of the pSPA.

11.4.144 There is, therefore, no potential for AEoI to the gannet feature of the Flamborough and Filey Coast pSPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, gannet will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Flamborough and Filey Coast pSPA - Kittiwake

11.4.145 Kittiwake was screened in on a precautionary basis for collision risk (Annex 1 to this report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.146 Thanet Extension is outside of the mean maximum foraging range of 60 km +/- 23.3 km (Thaxter et al., 2012) of the kittiwake breeding colony in the Flamborough and Filey Coast pSPA. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded kittiwakes in the Thanet Extension site during the spring, the breeding season and the autumn with the highest mean peak abundance being 235 birds and density of 3.23 birds / km² during the autumn. The majority of the kittiwakes from the aerial digital survey abundance estimates (63%) were sitting on the water in the Thanet Extension site.

11.4.147 The CRM predicted an annual total of 14.74 kittiwake collisions, consisting of 9.82 in the spring, 1.48 in the breeding season and 3.43 in the autumn (there is no winter bio-season for kittiwake). Those collisions predicted in the breeding season cannot be attributed to the pSPA as Thanet Extension is beyond the mean maximum foraging range of kittiwake and the individuals observed in the survey can be expected to be a combination of immature birds, non-breeding adults and adults from a more local colony that is not part of the European site network. With respect to predicted collisions outside the breeding season the assessment has to consider what proportion of those birds present in the southern North Sea may be attributed to the Flamborough and Filey Coast pSPA population of 89,040 adult birds from amongst the larger population present. Furness (2015) provides the basis on which that apportioning can be made. Sixty percent of the pSPA population is present in the North Sea in both the spring and autumn migration periods. This means that in the spring migration period 8.5% of the birds present can be attributed to the pSPA (60% of 89,040 divided by spring BDMPS of 627,816) and in the autumn period 6.4% of the birds present can be attributed to the pSPA (60% of 89,040 divided by the autumn BDMPS of 829,937). Accordingly, the collision predictions for the proposed Thanet Extension attributed to the pSPA are 0.84 in spring and 0.22 in autumn. These predictions represent a 0.006% and 0.002% increase in mortality in spring and autumn respectively relative to the background levels, this is a negligible change. There is no potential for an adverse effect on the population and hence on the integrity of the pSPA.

11.4.148 There is, therefore, no potential for AEoI to the kittiwake feature of the Flamborough and Filey Coast pSPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, kittiwake will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

Flamborough Head and Bempton Cliffs SPA - Kittiwake.

11.4.149 Kittiwake was screened in on a precautionary basis for collision risk (Annex 1 to this report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.150 The kittiwake breeding colony in the Flamborough Head and Bempton Cliffs SPA is outside of the mean maximum foraging range of 60 km +/- 23.3 km (Thaxter et al., 2012) of Thanet Extension. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded kittiwakes in the Thanet Extension site during the spring, the breeding season and the autumn with the highest mean peak abundance being 235 birds and density of 3.23 birds / km² during the autumn. The majority of the kittiwakes from the aerial digital survey abundance estimates (63%) were sitting on the water in the Thanet Extension site.

11.4.151 The CRM predicted an annual total of 14.74 kittiwake collisions, consisting of 9.82 in the spring, 1.48 in the breeding season and 3.43 in the autumn (there is no winter bio-season for kittiwake). Those collisions predicted in the breeding season cannot be attributed to the SPA as Thanet Extension is beyond the mean maximum foraging range of kittiwake and the individuals observed in the survey can be expected to come from a more local colony that is not part of the European site network. With respect to predicted collisions outside the breeding season the assessment has to consider what proportion of those birds present in the southern North Sea may be attributed to the Flamborough Head and Bempton Cliffs SPA population of 166,740 adult birds from amongst the larger population present. Furness (2015) provides the basis on which that apportioning can be made. Sixty percent of the SPA population is present in the North Sea in both the spring and autumn migration periods. This means that in the spring migration period 15.9% of the birds present can be attributed to the SPA (60% of 166,740 divided by spring BDMPS of 627,816) and in the autumn period 12.1% of the birds present can be attributed to the SPA (60% of 166,740 divided by the autumn BDMPS of 829,937). Accordingly, the collision predictions for the proposed Thanet Extension attributed to the SPA are 1.56 in spring and 0.41 in autumn. These predictions represent a 0.006% and 0.002% increase in mortality in spring and autumn respectively relative to the background levels, this is a negligible change. There is no potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.152 There is, therefore, no potential for AEoI to the kittiwake feature of the Flamborough Head and Bempton Cliffs SPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, kittiwake will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

St Abb's Head to Fast Castle SPA - Kittiwake

11.4.153 Kittiwake was screened in on a precautionary basis for collision risk (HRA Screening Report) pending a more detailed consideration of the potential for LSE based, on amongst other factors, the completion of the programme of 24 months of aerial survey.

11.4.154 The kittiwake breeding colony in the St Abb's Head to Fast Castle SPA is outside of the mean maximum foraging range of 60 km +/- 23.3 km (Thaxter et al., 2012) of Thanet Extension. Outside of the breeding season these birds may pass across the proposed site of Thanet Extension and be placed at risk of collision. The 24 months of aerial survey recorded kittiwakes in the Thanet Extension site during the spring, the breeding season and the autumn with the highest mean peak abundance being 235 birds and density of 3.23 birds / km² during the autumn. The majority of the kittiwakes from the aerial digital survey abundance estimates (63%) were sitting on the water in the Thanet Extension site.

11.4.155 The CRM predicted an annual total of 14.74 kittiwake collisions, consisting of 9.82 in the spring, 1.48 in the breeding season and 3.43 in the autumn (there is no winter bio-season for kittiwake). Those collisions predicted in the breeding season cannot be attributed to the SPA as Thanet Extension is beyond the mean maximum foraging range of kittiwake and the individuals observed in the survey can be expected to come from a more local colony that is not part of the European site network. With respect to predicted collisions outside the breeding season the assessment has to consider what proportion of those birds present in the southern North Sea may be attributed to the St Abb's Head to Fast Castle SPA population of 42,340 adult birds from amongst the larger population present. Furness (2015) provides the basis on which that apportioning can be made. Sixty percent of the SPA population is present in the North Sea in both the spring and autumn migration periods. This means that in the spring migration period 4.0% of the birds present can be attributed to the SPA (60% of 42,340 divided by spring BDMPS of 627,816) and in the autumn period 3.1% of the birds present can be attributed to the SPA (60% of 42,340 divided by the autumn BDMPS of 829,937). Accordingly, the collision predictions for the proposed Thanet Extension attributed to the SPA are 0.40 in spring and 0.10 in autumn. These predictions represent a 0.006% and 0.002% increase in mortality in spring and autumn respectively relative to the background levels, this is a negligible change. There is no potential for an adverse effect on the population and hence on the integrity of the SPA.

11.4.156 There is, therefore, no potential for AEoI to the kittiwake feature of the St Abb's Head to Fast Castle SPA in relation to collision risk effects from Thanet Extension alone and therefore, subject to natural change, kittiwake will be maintained as a feature in the long-term with respect to the potential for adverse effects from collision risk.

11.5 Onshore Biodiversity

11.5.1 Potential AEoI in respect of intertidal habitats for Thanet Coast and Sandwich Bay SPA qualifying features European golden plover and ruddy turnstone and Thanet Coast and the Sandwich Bay Ramsar qualifying feature ruddy turnstone were assessed within the subtidal and intertidal benthic ecology section.

11.5.2 As regards the potential for an AEoI from Thanet Extension alone on those intertidal habitats and therefore on the designated bird features, the benthic ecology assessment concluded that:

- The impacts resulting from temporary habitat loss/ disturbance during construction, O&M and decommissioning within the intertidal habitats (which include saltmarsh and the mudflat foreshore), will be temporary and of short-term duration, extending across a very small proportion of the available habitat of both the SPA and Ramsar; therefore, the magnitude of the impact is assessed as low for the saltmarsh and mudflat foreshore and both sites will be maintained in the long-term. There is therefore no potential for AEoI to the qualifying features of the Thanet Coast and Sandwich Bay Ramsar (ruddy turnstone) and Thanet Coast and Sandwich Bay SPA (ruddy turnstone and European golden plover);
 - There is no potential for AEoI to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay SPA (ruddy turnstone and European golden plover) and Thanet Coast and Sandwich Bay Ramsar (ruddy turnstone) in relation to increased suspended sediments and deposition effects during construction, O&M and decommissioning from Thanet Extension alone and therefore, subject to natural change, the intertidal habitats will be maintained in the long-term with respect to the potential for effect from increased suspended sediment and associated deposition; and
 - There is no potential for AEoI to the intertidal habitats used by the designated features of the Thanet Coast and Sandwich Bay SPA (ruddy turnstone and European golden plover) and Thanet Coast and Sandwich Bay Ramsar (ruddy turnstone) in relation to changes to physical processes during O&M and therefore, subject to natural change, the intertidal habitats will be maintained in the long-term with respect to the potential for effect from habitat loss and disturbance.
- 11.5.3 Consideration of the potential for an AEoI for the remaining LSE in respect of onshore biodiversity receptors is provided below. This includes consideration of habitat loss for species forming part of the Thanet Coast and Sandwich Bay Ramsar wetland invertebrate assemblage (construction, O&M and decommissioning). It also includes potential disturbance to Thanet Coast and Sandwich Bay SPA/ Ramsar qualifying bird species (European golden plover and ruddy turnstone and ruddy turnstone respectively) due to noise and visual disturbance (construction, O&M and decommissioning) and the possible displacement of recreational users from Pegwell Bay Country Park (construction and decommissioning).

Construction and Decommissioning

Habitat loss via land-take/ land cover change

- 11.5.4 The potential for habitat loss via land-take/ land cover change to result in an AEoI relates to the following designated sites and the relevant features:
- Thanet Coast and Sandwich Bay Ramsar:
 - Ramsar criterion 2: supports 15 British Red Data Book wetland invertebrates

11.5.5 The habitat requirements of the three wetland invertebrate assemblage species with the potential to be present within or immediately adjacent to the RLB are as follows (see ES Volume 4, Annex 5-6: Terrestrial Invertebrate Assessment Report (Document Ref: 6.5.5.6) for further details):

- *Didineis lunicornis* - strongly associated with patches of sun-baked bare or sparsely vegetated clay soil where deep desiccation cracks develop during summer months. Banks and level ground are both used. Many records relate to coastal soft rock cliffs, whilst inland records include unimproved grasslands (especially south-facing slopes), woodland rides and clearings, and re-vegetating quarries. Females prey on hoppers which are brought to nests typically dug close to waterbodies.
- *Ectemnius ruficornis* - associated with dead wood (fallen trees, stumps, old fence posts etc.) and dead parts of living trees, in sunny situations and in the vicinity of good stands of umbellifers. Seems to be more of a woodland insect in the southern parts of its British range but it likely has a preference for open woodland such as coppice. Its presence within the RLB is considered unlikely but can not be ruled out.
- *Eluma caelata* - A woodlouse that has a preference for disturbed habitats, whether this is on the coast (e.g. 'soft' slumping cliffs) or in synanthropic habitats (e.g. waste ground, railway lines and gardens). It typically takes refuge under mat-forming plants, beneath stones and dead wood, or among leaf-litter, tussocks, rubbish and other debris.

11.5.6 All three species are only likely to be present in the Stonelees Nature Reserve section of the RLB. Approximately 350 m of cabling would be trenched through Stonelees Nature Reserve, resulting in short-term loss of habitats including disturbed ground, scrub, semi-improved grassland and at least one small ephemeral water body over a width of up to 30 m. All habitat types are also present within the nature reserve in areas outside the RLB. Terrestrial habitats would be reinstated as soon as possible following completion of the works and ephemeral water bodies would be replaced.

11.5.7 Embedded mitigation includes the development of a terrestrial invertebrate mitigation strategy (forming part of the detailed LEMP), which will be informed by a detailed invertebrate survey of affected areas, prior to construction commencing. Specific measures will be included in the mitigation strategy to reduce effects on the three assemblage species, if present, e.g. micro-siting, where possible. Measures will also be included to ensure that suitable habitat for these species is maintained and enhanced following construction works. Further details are provided in the Outline LEMP (Document Ref. 8.7).

11.5.8 There are no published conservation objectives for the Ramsar site. However, it is reasonable to assume that conservation objectives would include the maintenance of the populations and distribution of wetland invertebrate assemblage species and their supporting habitats. Given the relatively small area which would be subject to temporary loss; the wide availability of similar habitats outside the RLB; the proposed reinstatement of habitats; and the embedded mitigation, the assumed conservation objectives are not likely to be compromised. There is, therefore, no potential for AEoI to the wetland invertebrate assemblage feature of Thanet Coast and Sandwich Bay Ramsar site from Thanet Extension alone.

Noise and Visual Disturbance

11.5.9 The potential for noise and visual disturbance during construction and decommissioning to result in an AEoI relates to the following designated sites and qualifying features:

- Thanet Coast & Sandwich Bay SPA:
 - Ruddy turnstone (Non-breeding); and
 - European golden plover (Non-breeding).
- Thanet Coast & Sandwich Bay Ramsar:
 - Ramsar Criterion 6 - Species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

Thanet Coast and Sandwich Bay SPA

11.5.10 The results of an analysis of non-breeding waterbird distribution in relation to the location of the proposed landfall are presented in the ES Volume 5, Annex 5-13: Intertidal Waterfowl Data Analysis in Relation to Onshore Works (Document Ref: 6.5.5.13). This analysis examined the numbers and activity of non-breeding waterbirds within 250 m of the location of the proposed landfall, as recorded during surveys carried out in 2016-17. A distance of 250 m was used because significant disturbance beyond 250m (other than disturbance due to very loud infrequent noise such as driven/ percussive piling) is unlikely. The 250m distance was based on a combination of professional judgement and relevant literature, e.g. Cutts *et al.* (2009) and Collop *et al.* (2016).

11.5.11 During the 2016-17 surveys a peak count of 390 European golden plover was recorded within 250 m of the landfall in November 2016 with lower numbers recorded in the same area in December and February and none recorded in January or March. Although not present consistently, the area within 250 m of the landfall can therefore support significant numbers of European golden plover. No ruddy turnstone were recorded within 250 m of the landfall during the 2016-17 surveys nor were any ruddy turnstone recorded within 500m of the landfall with the peak count across Pegwell Bay as a whole during the survey period being just eight. Disturbance to ruddy turnstone is therefore not likely.

11.5.12 Peak European golden plover numbers at Pegwell Bay occur during the period October to March with much lower numbers recorded outside this period (based on WeBS data for the period 2000/01-15/16 - see ES Volume 4, Annex 5-4: Baseline Ornithology Report (Document Ref: 6.5.5.4)). In order to avoid disturbance to potentially significant numbers of non-breeding European golden plover embedded mitigation (see Table 6.1) has been included that would involve a timing restriction on all construction and decommissioning works within intertidal habitats and at the shoreline. This would prevent any construction works taking place in these areas during the period October to March inclusive. In addition, any works within 250m of intertidal habitats that are undertaken between October and March but are not covered by seasonal restrictions and are in direct line of sight from intertidal habitats, e.g. works on the TJBs, will only take place following the erection of screening fencing. Furthermore, any driven/ percussive piling elsewhere within Pegwell Bay Country Park, e.g. if additional cofferdams are required to prevent the migration of contaminants if a buried solution is feasible (landfall options 1 and 3), would be subject to a timing restriction and would not take place during the period October to March. HDD works (landfall option 1), if feasible, would also be subject to the same timing restriction.

11.5.13 The conservation objectives for the SPA require the maintenance of the population of each of the qualifying features and the distribution of the qualifying features within the site. The implementation of the embedded mitigation measures described above effectively removes the potential for significant noise and visual disturbance to non-breeding European golden plover and the site's conservation objectives will not be compromised. There is, therefore, no potential for AEoI to the qualifying non-breeding bird species for the Thanet Coast and Sandwich Bay SPA from Thanet Extension alone.

Thanet Coast and Sandwich Bay Ramsar

11.5.14 The potential for AEoI for ruddy turnstone was assessed above in respect of the Thanet Coast and Sandwich Bay SPA. In the absence of conservation objectives for the Ramsar site, the conservation objectives for the SPA are considered valid. On the basis of the assessment against the relevant conservation objectives for the SPA, as set out above, there is no potential for AEoI to the ruddy turnstone qualifying feature of the Thanet Coast and Sandwich Bay Ramsar from Thanet Extension alone.

Potential Disturbance due to Possible Displacement of Recreational Users from Pegwell Bay Country Park

11.5.15 The potential for disturbance due to possible displacement of recreational users from Pegwell Bay Country Park to result in an AEoI relates to the following designated sites and qualifying features:

- Thanet Coast & Sandwich Bay SPA:
 - Ruddy turnstone (Non-breeding); and
 - European golden plover (Non-breeding).

- Thanet Coast & Sandwich Bay Ramsar:
 - Ramsar Criterion 6 - Species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

Thanet Coast and Sandwich Bay SPA

- 11.5.16 Although works at the shoreline will be subject to a timing restriction and will not take place during the period October to March, other works could take place within the country park during the more sensitive winter months. Disturbance to non-breeding European golden plover and ruddy turnstone is therefore possible if visitors are displaced from the country park to other more sensitive areas elsewhere within Pegwell Bay.
- 11.5.17 To examine the potential extent of possible displacement a desk-based study was undertaken, the results of which are presented in the ES Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5) and Volume 3, Chapter 4: Tourism and Recreation (Document Ref: 6.3.4). As part of this study, data for the number of car parking tickets sold at Pegwell Bay Country Park were provided by KCC for both 2016 and 2017. Comparison of the data between years indicated no significant difference in the number of visitors between the period that construction works for the Nemo Link were taking place within the country park (April to September 2017) and the corresponding period in 2016. This strongly suggests that visitor numbers at the country park are not likely to be significantly affected by the proposed construction works, which would be of similar scale to the works for the Nemo Link.
- 11.5.18 The above notwithstanding, a precautionary approach has been adopted which assumes that some displacement of recreational users of the country park is possible. Consideration of a visitor study carried out in 2012 (Strategic Marketing, 2012) indicates that the majority of visitors to Pegwell Bay Country Park (61%) came from Cliffsend or the Thanet towns. 58% of visitors' main reason for visiting was to walk their dog(s); most planned to walk less than two miles, 91% came by car and 87% were repeat visitors. This suggests that any displacement is most likely to involve regular dog walkers, travelling by car from the north. It is therefore assumed that displacement is most likely to affect sites to the north of the country park with easy vehicular access. This assumption is supported by anecdotal information from the operator of the coffee stall in the country park car park (pers. comm., March 2018) who, despite the car parking data, suggested that visitors were displaced during construction works for the Nemo Link and went instead to the 'pirate ship' picnic site at Cliffsend or the Western Undercliff at Ramsgate. Intertidal habitats adjacent to both locations are readily accessible and are already subject to relatively high numbers of visitors (Duncan Watson, personal observation).

11.5.19 The main concern of Natural England is that any displaced dog walkers could utilise the intertidal habitats. It is considered very unlikely that displaced visitors would utilise the saltmarsh habitats adjacent to Pegwell Bay Country Park which contain deep, wet creeks and are very difficult to walk across. It is also considered unlikely that significant numbers of visitors would utilise the mudflats and sandflats, although some usage of these areas, particularly in the northern half of Pegwell Bay, close to the alternative car parks at Cliffsend and the Western Undercliff, is possible.

11.5.20 As a precaution, embedded mitigation has been proposed to discourage any displaced visitors from accessing intertidal habitats during the sensitive October to March period (see Table 6.1). This would include the provision of additional signage and an Ecological Clerk of Works (or temporary warden/ natural ambassador) during the sensitive October to March period who would monitor visitor disturbance and would speak to visitors to discourage them from entering intertidal habitats, if required.

11.5.21 The conservation objectives for Thanet Coast and Sandwich Bay SPA include the maintenance of the population of each of the qualifying features and the distribution of the qualifying features within the site. Taking into account the low likelihood of visitor displacement, the location of the sites which visitors are most likely to be displaced to and the embedded mitigation, subject to natural change the population and distribution of the designated ruddy turnstone and European golden plover features will be maintained in the long-term. There is therefore no potential for AEoI to the qualifying features of the Thanet Coast and Sandwich Bay SPA from Thanet Extension alone.

Thanet Coast and Sandwich Bay Ramsar

11.5.22 The potential for AEoI for ruddy turnstone was assessed above in respect of the Thanet Coast and Sandwich Bay SPA. In the absence of conservation objectives for the Ramsar site, the conservation objectives for the SPA are considered valid. On the basis of the assessment against the relevant conservation objectives for the SPA, as set out above, there is no potential for AEoI to the ruddy turnstone qualifying feature of the Thanet Coast and Sandwich Bay Ramsar from Thanet Extension alone.

Operation and Maintenance

Disturbance/ Temporary Loss of Habitat

11.5.23 The potential for disturbance/ temporary loss of habitat during planned maintenance works to result in an AEoI relates to the following designated sites and the relevant features:

- Thanet Coast and Sandwich Bay Ramsar:
 - Ramsar criterion 2: supports 15 British Red Data Book wetland invertebrates.

- 11.5.24 As stated in relation to construction and decommissioning, the three wetland invertebrate assemblage species with the potential to be present within or immediately adjacent to the RLB are only likely to be present in the Stonelees Nature Reserve section of the RLB. During the O&M phase joint pits within Stonelees Nature Reserve may be subject to up to eight visits per year, either on foot or using a light vehicle.
- 11.5.25 Embedded mitigation includes the development of a terrestrial invertebrate mitigation strategy (forming part of the detailed LEMP), which will be informed by a detailed invertebrate survey of affected areas, prior to construction commencing. Specific measures will be included in the mitigation strategy to avoid effects on the three assemblage species, if present, during planned maintenance visits. Further details are provided in the Outline LEMP (Document Ref. 8.7).
- 11.5.26 There are no published conservation objectives for the Ramsar site. However, it is reasonable to assume that conservation objectives would include the maintenance of the populations and distribution of wetland invertebrate assemblage species and their supporting habitats. Given the very small area which would be affected by planned maintenance, the very limited nature of planned maintenance works and the embedded mitigation, the assumed conservation objectives are not likely to be compromised. There is, therefore, no potential for AEoI to the wetland invertebrate assemblage feature of Thanet Coast and Sandwich Bay Ramsar site from Thanet Extension alone.

Noise and Visual Disturbance

- 11.5.27 The potential for noise and visual disturbance during O&M to result in an AEoI relates to the following designated sites and qualifying features:
- Thanet Coast & Sandwich Bay SPA:
 - Ruddy turnstone (Non-breeding); and
 - European golden plover (Non-breeding).
 - Thanet Coast & Sandwich Bay Ramsar:
 - Ramsar Criterion 6 - Species/ populations occurring at levels of international importance: Ruddy turnstone (Non-breeding).

Thanet Coast and Sandwich Bay SPA

- 11.5.28 In order to avoid disturbance to potentially significant numbers of non-breeding European golden plover and ruddy turnstone embedded mitigation (see Table 6.1) has been included that would involve a timing restriction on any planned maintenance within intertidal habitats and at the shoreline. This would prevent any works taking place in these areas during the period October to March inclusive.

- 11.5.29 The conservation objectives for the SPA require the maintenance of the population of each of the qualifying features and the distribution of the qualifying features within the site. The implementation of the embedded mitigation measures described above effectively removes the potential for significant noise and visual disturbance to non-breeding European golden plover and ruddy turnstone and the site's conservation objectives will not be compromised. There is, therefore, no potential for AEoI to the qualifying non-breeding bird species for the Thanet Coast and Sandwich Bay SPA from Thanet Extension alone.

Thanet Coast and Sandwich Bay Ramsar

- 11.5.30 The potential for AEoI for ruddy turnstone was assessed above in respect of the Thanet Coast and Sandwich Bay SPA. In the absence of conservation objectives for the Ramsar site, the conservation objectives for the SPA are considered valid. On the basis of the assessment against the relevant conservation objectives for the SPA, as set out above, there is no potential for AEoI to the ruddy turnstone qualifying feature of the Thanet Coast and Sandwich Bay Ramsar from Thanet Extension alone.

12 Assessment of Adverse Effect In-combination

- 12.1.1 Screening for designated sites and features in-combination is presented in section 8, essentially identifying the plans and projects to be considered for assessment. The assessment presented here draws on that presented within relevant topic specific chapters of the ES, tailored for the requirements of the RIAA, to enable the determination of AEol in-combination to the features and effects screened in.
- 12.1.2 In assessing the potential for in-combination effects associated with Thanet Extension, it is important to bear in mind that some projects, predominantly those 'proposed' or identified in development plans etc. may or may not actually be taken forward. There is thus a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For example, relevant projects/ plans with consent and (if required) CfD (or similar) are more likely to contribute to in-combination impact with Thanet Extension (providing effect or spatial pathways exist), whereas projects/ plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors.
- 12.1.3 For this reason, all relevant projects/ plans considered in-combination alongside Thanet Extension have been allocated into 'Tiers', reflecting their current stage within the planning and development process. Where the tiering approach differs between receptor groups, this is noted in the relevant section. The tiering approach allows the in-combination impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out. The definition of each tier is described in section 8, with the plans and projects screened in for further consideration here defined within Table 12.1: In-combination projects and maximum design scenario and Table 12.2 on a receptor by receptor basis.
- 12.1.4 For each plan/ project screened in, the in-combination maximum adverse scenario draws on the information presented in topic specific chapters of the ES. The aim is to identify, for each receptor group, the aspects of the plans, projects and programmes screened in to be assessed. Consideration is given to the following points:
- Level of detail available for project/ plans;
 - Potential for an effect-pathway-receptor link;
 - Potential for a physical interaction; and
 - Potential for temporal interaction.
- 12.1.5 Table 12.1 below identifies, for all plans and projects screened in for consideration in-combination, the relevant receptor group(s), the maximum adverse scenario as it applies to that receptor group(s) and the relevant years within which the works are planned to occur. It is of note that, for a number of projects, insufficient information exists to provide a maximum adverse scenario, with that noted where relevant.

Table 12.1: In-combination projects and maximum design scenario

Status	Project/ Plan Name	Tier	Relevant Receptor						Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology	Onshore Biodiversity		
Offshore Wind Farm										
Pre-planning	Dunkirk	4							Insufficient information to enable assessment. Therefore, nothing to include in the in-combination maximum adverse scenario.	Unknown
In Planning	Dieppe-le Treport	3							Insufficient information to enable assessment. Therefore, nothing to include in the in-combination maximum adverse scenario.	Unknown
	East Anglia Norfolk Boreas	4							Scoping report gives offshore construction commencing in 2025. Construction window does not overlap with that of Thanet Extension and therefore no potential for in-combination effect with underwater construction noise. Therefore, nothing to include in the in-combination maximum adverse scenario for marine mammals. Offshore ornithology considered separately.	Installation 2025-2029
	Hornsea Project Three	4							PEIR has onshore construction commencing in 2021, with piling to commence from 2024. Piling at Thanet Extension is scheduled to end prior to that point and therefore piling at Hornsea Project Three has no potential for overlap with piling at Thanet Extension. Offshore ornithology considered separately.	WTG foundations 2024 onwards
	Norfolk Vanguard East	4							The offshore construction at the Norfolk Vanguard projects is scheduled to commence in 2024, with piling of turbines at Thanet Extension scheduled for completion by Q2 2023. Offshore ornithology considered separately.	Installation 2024-2028
	Norfolk Vanguard West	4								
	East Anglia ONE North	4							Project Scoping issued, with DCO to be submitted 2019-2020 but no construction dates provided. Construction window assumed to not overlap with that of Thanet Extension; therefore no potential for in-combination effect with underwater construction noise. Therefore, nothing to include in the in-combination maximum adverse scenario for marine mammals. Offshore ornithology considered separately.	DCO to be submitted 2020
	East Anglia TWO	4								DCO to be submitted 2019

Status	Project/ Plan Name	Tier	Relevant Receptor					Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology		
	Fecamp – Seine-Maritime	2						Insufficient information to enable assessment. Therefore, nothing to include in the in-combination maximum adverse scenario.	2019-2021
	Hollandse Kust noord 1	2							Unknown
	Hollandse Kust noord 2	2							Unknown
	Hollandse Kust zuid 1 & 2	3							Unknown
	Hollandse Kust zuid 3 & 4	3							Unknown
Consented	Borssele 1 & 2, 3 & 4, 5	1						Maximum design scenario considers the longest duration of the piling phase for each of the projects. Where projects do not overlap but run consecutively, it is assumed that piling could occur at any point within the construction phase therefore giving the longest duration of a potential piling phase.	2020
	Dogger Bank Creyke Beck A & B	2 (marine mammals) 3 (offshore ornithology)						Maximum design scenario considers the longest duration of the piling phase for each of the projects. Where projects do not overlap but run consecutively, it is assumed that piling could occur at any point within the construction phase therefore giving the longest duration of a potential piling phase.	Construction window 2021-2024
	Dogger Bank Teesside A								Construction window 2020 onwards for 6 years
	Sofia								Offshore ornithology considered separately.

Status	Project/ Plan Name	Tier	Relevant Receptor					Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology		
	East Anglia THREE	2 (marine mammals) 3 (offshore ornithology)						Maximum design scenario considers the longest duration of the piling phase for each of the projects. Where projects do not overlap but run consecutively, it is assumed that piling could occur at any point within the construction phase therefore giving the longest duration of a potential piling phase. Offshore ornithology considered separately.	From 2020 (marine mammals) all years (offshore ornithology)
	Firth of Forth (Seagreen) Alpha and Bravo	3						Consented but not implemented. Offshore ornithology considered separately.	All years
	Hornsea Project TWO	1 (marine mammals) 3 (offshore ornithology)						Maximum design scenario considers the longest duration of the piling phase for each of the projects. Where projects do not overlap but run consecutively, it is assumed that piling could occur at any point within the construction phase therefore giving the longest duration of a potential piling phase. Offshore ornithology considered separately.	Construction window of January 2017 to December 2021; piling to occur at some point within that window but programmed Q1 2018-Q3 2021 (marine mammals) All years (offshore ornithology)
	Inch Cape	2						Consented but not implemented.	All years
	Mermaid	2						Insufficient information to enable assessment; what limited information is available indicates limited potential for a temporal overlap of construction. Therefore, nothing to include in the in-combination maximum adverse scenario.	2017-2019
	Moray Firth (Eastern DA)	2						Consented but not implemented.	All years
	Near na Gaoithe	2						Consented but not implemented.	All years

Status	Project/ Plan Name	Tier	Relevant Receptor						Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology	Onshore Biodiversity		
	Seastar	2							Insufficient information to enable assessment. Therefore, nothing to include in the in-combination maximum adverse scenario.	Unknown
	Triton Knoll	1 (marine mammals) 3 (offshore ornithology)							Construction window assumed to not overlap with piling activity at Thanet Extension and therefore no potential for in-combination effect with underwater construction noise. Potential remains for overlap with geophysical surveys and UXO clearance (if required) at Thanet Extension. Offshore ornithology considered separately.	Construction window of 2017 to 2021; piling to occur at some point within that window but anticipated to be complete by the end of the summer season 2020 (marine mammals) All years (offshore ornithology)
Under construction (or constructed but not yet operational)	Beatrice	2							Under construction (or constructed but not yet operational) Marine mammals: Construction window assumed to not overlap with that of Thanet Extension and therefore no potential for in-combination effect with underwater construction noise. Potential remains for overlap with geophysical surveys and UXO clearance (if required) at Thanet Extension. Offshore ornithology: All years	Marine mammals: Q1-Q2 2019 at Hornsea ONE only East Anglia ONE installation 2018 Ornithology: All years
	East Anglia ONE	1 (marine mammals) 2 (offshore ornithology)								
	EOWDC [Aberdeen]									
	Hornsea Project ONE	Marine Mammals (1) Offshore ornithology (2)								
	Race Bank	2								

Status	Project/ Plan Name	Tier	Relevant Receptor						Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology	Onshore Biodiversity		
	Rampion	1								
Operational	Beatrice Demonstrator	1							Built, formerly operational but at present out of commission.	All years
	Blyth	1								
	Dudgeon	1						Operational.		
	Galloper	1								
	Greater Gabbard	1								
	Gunfleet Sands I & 2	1								
	Humber Gateway	1								
	Kentish Flats	1								
	Kentish Flats Extension	1								
	Lincs	1								
	London Array	1								
	Lynn and Inner Dowsing	1								
	Scroby Sands	1								
	Sheringham Shoal	1								
	Teesside	1								
Thanet	1									

Status	Project/ Plan Name	Tier	Relevant Receptor						Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology	Onshore Biodiversity		
	Westermost Rough	1								
Cable installation										
Under construction	Nemo interconnector	1							<p>Benthic ecology: The Nemo replacement export cable will result in temporary habitat loss of 340,000 m² in UK waters (within 12 km of Thanet Extension) from the installation of up to two cables in one trench.</p> <p>If cable protection is used, the significance of the effect of long-term habitat loss from the Nemo interconnector cable has been assessed as minor in UK waters.</p> <p>Marine mammals: Noise impacts arising from cable installation has been screened out on the basis that these are considered to be highly localised, short-term, and of negligible magnitude.</p> <p>Onshore biodiversity: The onshore elements of the Nemo project include the construction of a converter station occupying 4.85 ha and temporary habitat loss/ disturbance at the landfall and along a 2.1 km cable route.</p> <p>Offshore ornithology considered separately.</p>	Submarine cable in UK waters installed 2017, onshore UK works almost complete (March 2018)
Disposal Area										
Open	Nemo Disposal Site B	1							<p>The Nemo Interconnector cable has permission to use three disposal sites, with the two sites screened into this cumulative effects assessment having a total permitted disposal volume of 94,308 m³.</p> <p>The use of the Pegwell Bay and Ramsgate Harbour disposal sites is primarily for the dumping of sediment removed during maintenance dredging. The use of these sites is intermittent and the volumes used are unknown in advance and therefore it is not possible to determine if the use of the sites will overlap with impacts from the</p>	2017
	Nemo Disposal Site C	1								
	Pegwell Bay	2								
	Pegwell Bay B	2								

Status	Project/ Plan Name	Tier	Relevant Receptor						Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology	Onshore Biodiversity		
	Ramsgate Harbour Site A	2							construction of Thanet Extension. However, while the volumes are likely to be greater, the impacts are likely to be similar to those for the deposition of the drilling arisings predicted for Thanet Extension.	Ongoing (dates not known in advance)
	Ramsgate Harbour Site B	2								
Other Onshore Developments										
Pre-planning	Manston Airport Upgrading and Re-opening	4							<p>The scoping report (AFW, 2016) states that the airport will be upgraded to enable it to handle >10,000 air freight traffic movements per year. The upgrades will include modifications to the runway and taxiway network, two new aprons extending to >20 ha, relocation of cargo facilities occupying circa 18. 6 ha, redevelopment of a number of associated services and a new access.</p> <p>Insufficient information regarding potential effects is available to enable assessment.</p>	Unknown. Application withdrawn in May 2018 and resubmission yet to take place
Under construction	Biomass CHP Plant, Discovery Park, Sandwich	1							<p>The development comprises a biomass CHP Plant with an electrical output capacity of 12-15 MW and a wood fuel preparation area covering a total area of approximately 4 hectares.</p> <p>The site is within 50 m of the Thanet Coast and Sandwich Bay SPA and Ramsar. The operation of the site will result in operational noise, although the operational noise assessment for the project concludes that there are no LSE for SPA birds.</p>	Due to be operational in Q1 2018

Status	Project/ Plan Name	Tier	Relevant Receptor						Maximum Design Scenario	Relevant Years
			Intertidal and subtidal	Harbour porpoise	Harbour Seal	Grey Seal	Offshore ornithology	Onshore Biodiversity		
Consented	Mixed use development, Discovery Park, Sandwich	1							<p>The development includes: demolition of some existing buildings (and associated infrastructure); change of use of some existing buildings; the provision of new commercial and residential development; associated site preparation/enabling, infrastructure, and landscaping works; and provision of car parking.</p> <p>The site lies adjacent to the Thanet Coast and Sandwich Bay SPA and Ramsar. According to the ES and Updated Information to inform Appropriate Assessment (Buro Happold, 2014a and b) pollution and noise disturbance will be avoided by mitigation. Residential development could lead to an increase in recreational pressure but this is not likely to be significant after mitigation, which includes provision of 20ha open space and a contribution to wardening and monitoring at Pegwell Bay and Sandwich.</p>	Outline consent granted 2014, completion date unknown.
Consented	Richborough Connection Project	1							<p>The project comprises a 400kV electricity transmission connection between Richborough and Canterbury.</p> <p>National Grid (2016) identified possible effects resulting from collision, disturbance and displacement to European golden plover forming part of the Thanet Coast and Sandwich Bay SPA population, which use fields along the route for foraging. Embedded mitigation, including timing restriction in sensitive areas, controls on lighting and noise and use of screening fencing, is included to reduce disturbance and the assessment concluded that there would be no significant effects.</p> <p>Note that there is no potential for collision impacts resulting from Thanet Extension so in-combination effects due to collision are not possible.</p>	Construction of the new line (and removal of the old line) is due to be completed between 2018 and 2021.

12.1.7 Table 12.2 below draws on the above information, to determine the potential for an in-combination effect. Essentially, for a plan or project to have a potential in-combination effect with Thanet Extension, there needs to be sufficient information on which to base an assessment and the construction timeframe needs to be such that there is potential for temporal overlap of effect(s). That potential is identified, for each receptor group, in Table 12.2 below.

Table 12.2: Receptor Groups and the effects to assess in-combination

Project	Potential Effect	Timing of Effect	Summary	Relevant Aspect of Thanet Extension		
				Construction	Operation	Decommissioning
Sites primarily designated for subtidal and benthic intertidal habitats						
Nemo interconnector	Temporary habitat loss	2017	No temporal overlap therefore no in-combination effect	N/A	N/A	N/A
	SSC and deposition	2017		N/A	N/A	N/A
	Potential for permanent habitat loss	Ongoing	Only if cable protection is used within a designated site. Not known to date.	None identified		
Open disposal ground	SSC and deposition	Ongoing	The use of these sites is intermittent and the volumes used are unknown in advance and therefore it is not possible to determine if the use of the sites will overlap with impacts from the construction of Thanet Extension	N/A	N/A	N/A
Sites primarily designated for Marine Mammals						
East Anglia Norfolk Boreas East Anglia ONE North East Anglia ONE East Anglia TWO Fecamp-Seine Maritime Hollandse Kust noord 1 Hollandse Kust noord 2 Hollandse Kust zuid 1 & 2 Hollandse Kust zuid 3 & 4 Hornsea Project Three	Underwater noise	Unknown or outwith the timeframe for Thanet Extension	No known temporal overlap therefore no in-combination effect	N/A	N/A	N/A

Project	Potential Effect	Timing of Effect	Summary	Relevant Aspect of Thanet Extension		
				Construction	Operation	Decommissioning
Mermaid Seastar Dunkirk Dieppe-le-Treport						
East Anglia THREE	Underwater noise	From 2020	Potential for temporal overlap	SNS cSAC (harbour porpoise) Transboundary sites for harbour seals (Voordelta, Vlaamse Banken) Transboundary sites for grey seals (Bancs des Flandres, Vlakte van de Raan, Vlaamse Banken, Voordelta, SBZ1, SBZ2, SBZ3)	N/A	N/A
Borssele 1 & 2, 3 & 4, 5	Underwater noise	Piling window includes that for Thanet Extension	Potential for construction window overlap	SNS cSAC (harbour porpoise) Transboundary sites for harbour seals (Bancs des Flandres, Vlakte van de Raan, Voordelta, Vlaamse Banken) Transboundary sites for grey seals (Bancs des Flandres, Recifs Gris-Nez Blanc Nez, Vlakte van de Raan, Vlaamse Banken, Voordelta, SBZ1, SBZ2, SBZ3, Ridens et dunes hydrauliques)	N/A	N/A

Project	Potential Effect	Timing of Effect	Summary	Relevant Aspect of Thanet Extension		
				Construction	Operation	Decommissioning
Dogger Bank Creyke Beck A & B Dogger Bank Teesside A Sofia Hornsea Project TWO				SNS cSAC (harbour porpoise)		
Hornsea Project ONE Triton Knoll	Underwater noise	Piling window ends prior to offshore construction starting at Thanet Extension	Potential for overlap with Thanet Extension pre-construction activities	SNS cSAC (harbour porpoise)	N/A	N/A
Nemo	Underwater noise	2017	No temporal overlap. Negligible effect screened out	N/A	N/A	N/A
Sites primarily designated for Offshore Ornithology						
Offshore cables (Nemo)	Direct disturbance and displacement	In the construction phase of these projects	Potential for temporal overlap if they are constructed at the same time	Outer Thames Estuary SPA	N/A	N/A
OWFs (listed in Table 8.4)	Direct disturbance and displacement	In the construction and O&M phase of Thanet Extension and the OWFs	OWFs affect red-throated diver populations in the UK part of the southern North Sea	Outer Thames Estuary SPA	Outer Thames Estuary SPA	Outer Thames Estuary SPA
OWFs (listed in Table 8.4)	Collision risk	In the operational phase of Thanet Extension and the OWFs	OWFs affect seabird populations from a series of SPA and Ramsar sites along the western seaboard of the North Sea	N/A	Alde-Ore Estuary SPA Alde-Ore Estuary Ramsar Flamborough Head and Bempton Cliffs SPA Flamborough and Filey Coast pSPA St Abb's Head to Fast Castle SPA	N/A

Project	Potential Effect	Timing of Effect	Summary	Relevant Aspect of Thanet Extension		
				Construction	Operation	Decommissioning
Sites primarily designated for Onshore Biodiversity						
Nemo interconnector	Temporary habitat loss	2017-18	No temporal overlap therefore no in-combination effect	N/A	N/A	N/A
	Disturbance during Construction	2017-18	No temporal overlap therefore no in-combination effect	N/A	N/A	N/A
	Displacement of recreational visitors from Pegwell Bay Country Park	2017-18	No temporal overlap therefore no in-combination effect	N/A	N/A	N/A
Biomass CHP Plant, Discovery Park, Sandwich	Disturbance due to operational noise	2018 onwards	Temporal overlap with operation of Thanet Extension likely	N/A	Thanet Coast and Sandwich Bay SPA Thanet Coast and Sandwich Bay Ramsar	N/A
Mixed use development, Discovery Park, Sandwich	Displacement of recreational visitors from Pegwell Bay Country Park	Once residential development has been constructed	Temporal overlap with Thanet Extension possible	Thanet Coast and Sandwich Bay SPA Thanet Coast and Sandwich Bay Ramsar	N/A	Thanet Coast and Sandwich Bay SPA Thanet Coast and Sandwich Bay Ramsar
Richborough Connection Project	Disturbance during construction	2018-2021	Temporal overlap with construction of Thanet Extension possible	Thanet Coast and Sandwich Bay SPA	N/A	N/A
	Displacement during operation	2019 onwards	Temporal overlap with construction and operation of Thanet Extension possible	Thanet Coast and Sandwich Bay SPA	Thanet Coast and Sandwich Bay SPA	N/A

12.1.8 Following the identification of the plans and projects with the potential to result in an AEoI in-combination with Thanet Extension, the assessment is made below. The information is presented according to the following receptor groupings:

- Subtidal and Benthic Intertidal Habitats;
- Marine Mammals;
- Offshore Ornithology; and
- Onshore Biodiversity.

12.2 Subtidal and Benthic Intertidal Habitats

12.2.1 No plans or projects have been screened in for in-combination assessment for subtidal and benthic intertidal habitats and therefore there will be no AEoI from Thanet Extension in-combination with other plans or projects on the subtidal and benthic intertidal habitats screened in for assessment.

12.3 Marine Mammals

12.3.1 A description of the significance of potential in-combination effects upon the receptors grouped under 'marine mammals' is provided below, drawing on Volume 2, Chapter 7: Marine Mammal (Document Ref: 6.2.7).

Construction and Decommissioning

Underwater Noise

12.3.2 The potential for underwater noise during construction to result in an AEoI in-combination with Thanet Extension relates to the following designated sites and the relevant features:

- SNS cSAC (harbour porpoise);
- Transboundary sites for grey seals (Bancs des Flandres, Recifs Gris-Nez Blanc-Nez, Vlake van de Raan, Vlaamse Banken, Voordelta, SBZ1, SBZ2, SBZ3 and Ridens et dunes hydrauliques du détroit du Pas-de-Calais) (9 sites); and
- Transboundary sites for harbour seals (Bancs des Flandres, Vlake van de Raan, Voordelta and Vlaamse Banken) (four sites).

12.3.3 The remaining transboundary sites screened in for LSE in relation to Thanet Extension alone lie further than the species specific screening range from the projects screened in for assessment and there is, therefore, no potential for an in-combination effect with the following sites:

- Bancs de Flandres SCI (screened out for harbour porpoise only);
- Recifs Gris-Nez Blanc-Nez (screened out for harbour seal only);
- Baie de Canche et couloir des trois estuaires (screened out for harbour seal and grey seal);
- Estuaires et littoral picards (baies de Somme et d'Authie) (screened out for harbour seal and grey seal); and
- Ridens et dunes hydrauliques du détroit du Pas-de-Calais (screened out for harbour seal only).














12.3.4 The plans and projects identified in Table 12.2 above with the potential to contribute to an in-combination effect on one or more designated site are as follows, together with the relevant species:

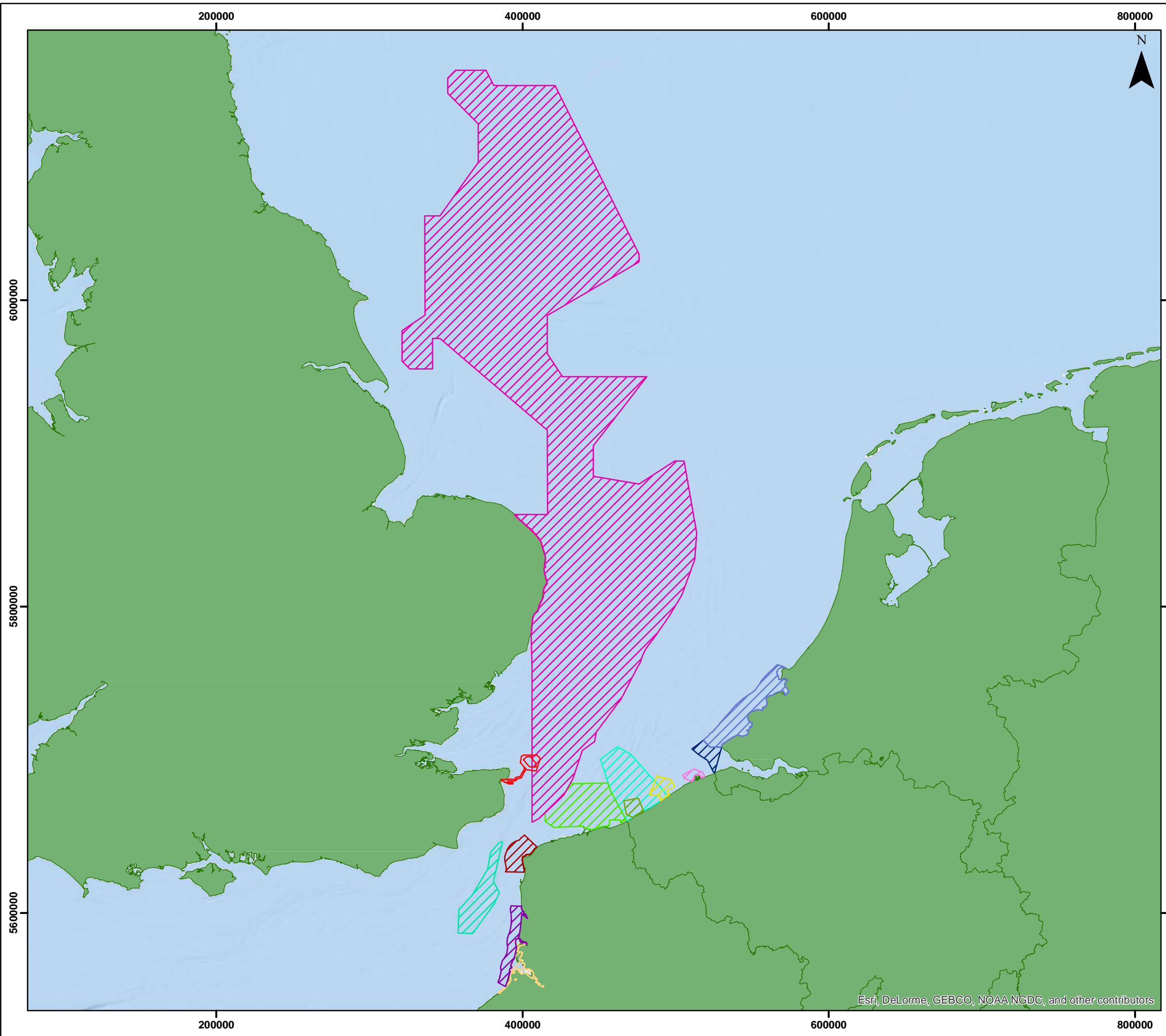
- East Anglia THREE (harbour porpoise, harbour seal and grey seal);
- Borssele 1 & 2, 3 & 4, 5 (harbour porpoise, harbour seal and grey seal);
- Dogger Bank Creyke Beck A & B (harbour porpoise);
- Dogger Bank Teesside A (harbour porpoise);
- Sofia (harbour porpoise);
- Hornsea Project TWO (harbour porpoise);
- Hornsea Project ONE (harbour porpoise); and
- Triton Knoll (harbour porpoise).

12.3.5 The locations of these designated sites, in relation to Thanet Extension, are shown in Figure 12.1. The locations of these plans and projects are depicted in Figure 12.2.

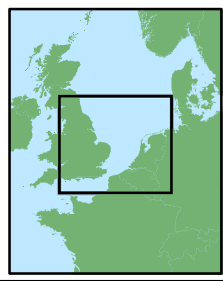
THANET EXTENSION OFFSHORE WIND FARM

Figure 12.1
Sites Identified for Marine Mammals in Relation to Thanet Extension

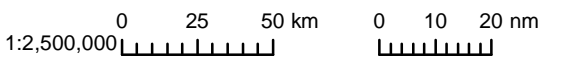
- Legend**
-  Offshore Red Line Boundary
 - Identified Designated Sites
 -  Baie de Canche et couloir des trois estuaires
 -  Bancs des Flandres
 -  Estuaires et littoral picards (baies de Somme et d'Authie)
 -  Ridens et dunes hydrauliques du détroit du Pas-de-Calais
 -  Récifs Gris-Nez Blanc-Nez
 -  SBZ 1 / ZPS 1
 -  SBZ 2 / ZPS 2
 -  SBZ 3 / ZPS 3
 -  Southern North Sea
 -  Vlaamse Banken
 -  Vlakte van de Raan
 -  Voordelta



Datum: ETRS 1989
Projection: UTM31N



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© European Environment Agency, 2018



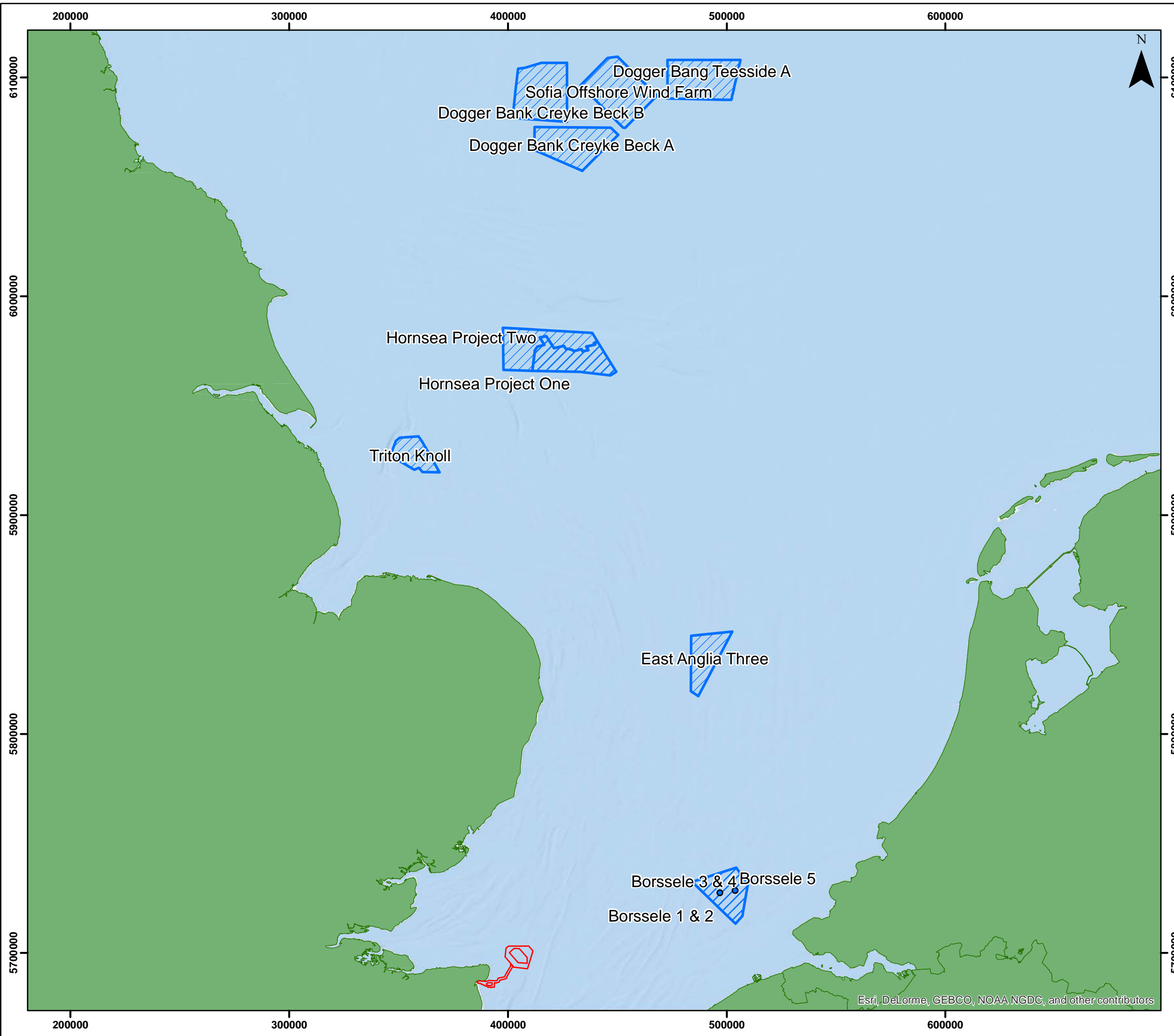
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

Drg No	Fig12.1_MarineMammalsSites			Figure 12.1
Rev	0.1	Date	27/04/2018	
By	RM	Layout	N/A	

THANET EXTENSION OFFSHORE WIND FARM

Figure 12.2
Other OWFs for
Consideration In-Combination
with Thanet Extension

- Legend**
- Offshore Red Line Boundary
 - Other Offshore Wind Farms
 - Borssele Wind Farms (Mid-Points)



Datum: ETRS 1989
Projection: UTM31N



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1:1,750,000

0 10 20 km 0 10 20 nm

Drg No	Fig12.2_OtherOWFs			Figure 12.2
Rev	0.1	Date	30/04/2018	
By	RM	Layout	N/A	

Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

12.3.6 Timeframes for decommissioning are highly uncertain for all projects and therefore an assessment of the potential for an in-combination effect during decommissioning cannot be made at this time. However, it is likely that the potential for effect during decommissioning would be less than that during construction, and would be assessed in line with the regulatory requirements at the time.

12.3.7 As highlighted in the AEoI for the project alone, there are a number of potential sources of underwater noise associated with construction of an OWF. Comment on these for the purposes of the in-combination assessment is provided below:

- UXO clearance – the only planned in-combination UXO clearance identified within the timeframe of relevant activities at Thanet Extension is for Triton Knoll⁷⁴;
- Percussive piling – to be carried through to the assessment in-combination;
- Increased vessel traffic – given the small and localised increase above baseline in vessel movements associated with construction of an offshore wind farm, existing levels of shipping across the region, known tolerance of harbour porpoise, harbour seal and grey seal to shipping (see section 8), together with the variable timing for construction of projects screened in for in-combination assessment when compared to Thanet Extension and the widely dispersed nature of the projects to consider in-combination, vessel traffic has not been taken forward to assessment in-combination as it is considered that there is no potential for an in-combination effect above trivial;
- Cable laying, seabed dredging and drilling for foundation installation – as noted in section 8, such activities would result in a highly localised and short-term level of effect only, with these therefore not taken forward in-combination as no pathway exists for an in-combination effect;

- Geophysical survey – the only planned geophysical survey identified for the projects screened in for in-combination assessment within the timeframe of relevant activities at Thanet Extension is for Triton Knoll⁷⁵; and
- ADDs – no LSE applies alone, with the small scale, temporary and intermittent nature of the effect being insufficient to result in any meaningful in-combination effect. Therefore, ADDs have not been taken forward to the in-combination assessment.

12.3.8 Focusing the assessment in-combination on percussive piling noise (together with project related sources of underwater noise, namely UXO clearance, geophysical survey and piling) is supported by the ES, which found that *‘during the offshore construction of Thanet Extension, the main source of cumulative impacts from underwater noise is likely to be from piling operations from other projects, plans and activities’*. The ES has a similar focus on piling noise for the cumulative assessment for marine mammals.

12.3.9 The potential for underwater noise to result during construction of Thanet Extension, together with the sensitivity of harbour porpoise, harbour seal and grey seal to such noise, has been discussed in section 11.3 as part of the assessment of AEoI alone, with that information not repeated here.

12.3.10 The assessment in-combination is made below, initially for harbour porpoise and then for harbour seal and grey seal.

Potential for an In-combination Effect on Harbour Porpoise from Underwater Noise

12.3.11 Table 12.3 below provides further information on the potential for temporal in-combination effects in relation to the above plans and projects screened in for assessment in relation to harbour porpoise only and is therefore limited to the SNS cSAC, as the Bancs de Flandres SCI has been screened out of the in-combination assessment for harbour porpoise.

⁷⁴ It is noted that previous projects undertaking RIAA within or in close proximity to the SNS cSAC have made consideration of clearance occurring on a sporadic basis across the region (eg OSPAR based data <https://www.ospar.org/work-areas/eiha/munitions>). However, as has previously been concluded, such clearance is adhoc and expected to decrease from recent levels. There is no certainty that clearance will occur within the relevant timeframe and, if it does, for that clearance

to occur within 26 km of the SNS cSAC boundary. Therefore such clearance has been considered de minimis in this context and excluded from the assessment.

⁷⁵ Further, the BEIS database which provides information on planned oil and gas related geophysical surveys does not extend sufficiently far into the future to enable such surveys to be included <https://www.gov.uk/guidance/oil-and-gas-environmental-data#pets-applications>

Table 12.3: Temporal overlap with Thanet Extension of plans and projects considered in-combination (harbour porpoise) (winter season only⁷⁶)

Project	Temporal Overlap with Construction Window					Relevant Activity
	Winter Season (2018-2019)	Winter Season (2019-2020)	Winter Season (2020-2021)	Winter Season (2021-2022)	Winter Season (2022-2023)	
Thanet Extension						Seismic survey (currently uncertain requirement for, timing and duration but would precede the piling and UXO clearance) to be undertaken 2019 at the earliest (but 2020 being more likely)
Thanet Extension						UXO clearance (currently uncertain requirement for, timing and duration but would precede the piling, likely to be within 6 months of piling) to be undertaken 2019 at the earliest (but 2020 being more likely)
Thanet Extension						Construction piling. Offshore construction to start in 2021
Tier 1 (Grey shading represents the construction window within which the activity may occur)						
Borssele 1, 2, 3, 4 & 5						Foundation piling (2020)
Triton Knoll						Seismic survey
Triton Knoll						UXO clearance
Triton Knoll						Foundation piling
Hornsea Project One						Percussive piling February 2018-May 2019
Hornsea Project Two						Piling programmed Q1 2018-Q3 2021
Tier 2 (Grey shading represents the construction window within which the activity may occur)						
Dogger Bank Creyke Beck A&B						Consent issued but no CFD. Construction window 2021-2024
Dogger Bank Teesside A						Consent issued but no CFD. Construction window 2020 onwards for 6 years

⁷⁶ As Thanet Extension is located at least 229 km from the summer extents of the SNS cSAC and therefore, as concluded in the assessment of AEoI for the project alone, Thanet Extension can only contribute to an effect on the SNS cSAC during the winter season. The in-combination assessment is therefore limited to the winter seasons within which relevant works may occur at Thanet Extension.

Project	Temporal Overlap with Construction Window					Relevant Activity
	Winter Season (2018-2019)	Winter Season (2019-2020)	Winter Season (2020-2021)	Winter Season (2021-2022)	Winter Season (2022-2023)	
Sofia						Consent issued but no CFD. Construction window 2020-2025
East Anglia THREE						Consent issued but no CFD. Offshore construction would begin in 2020 at the earliest
Tier 3 (None identified)						
Tier 4 (None identified)						

- 12.3.13 There is strong presumption of certainty that Tier 1 projects will proceed to construction on the specified timeframe and scale, with these projects having achieved consent, CfD and preparing for construction along the scale and timeframe specified. Thanet Extension is progressing on the timeframe and scale specified by VWPL, as included within the assessment process as the project design and project programme (section 5), and therefore can be afforded the same level of certainty within the in-combination assessment here.
- 12.3.14 For Tier 2, 3 and 4 projects, there is a much lower degree of certainty in terms of project programme timeframe and project scale. Whilst it is recognised that the planned construction windows of the Tier 2, 3 and 4 wind farm projects, where publicly available, may overlap with (and may extend beyond) the construction window of Thanet Extension, it is acknowledged, in common with all such projects with such a large construction window during the planning process and prior to securing a Contract for Difference (CfD), that actual construction will last for a proportion of the total construction window and that in reality the actual construction window may shift further. In addition, it is not uncommon for the scale of a project to change following consent or achieving CfD, for example a reduced number of WTGs (potentially with an increased capacity per WTG) may be progressed to final scheme design.
- 12.3.15 It is considered that given the stage these projects have reached, and the remaining stages to complete, that none of the Tier 2, 3 or 4 projects will actually construct during the same timeframe as Thanet Extension and that uncertainty remains regarding the final scheme design for these projects (albeit that the final design will fall within the maximum assessed and consented for each project). The reasons for this are outlined below:
- None of the Tier 2, 3 or 4 projects have to date (April 2018) secured a CfD;
 - Based on current government announcements, the next CfD round will commence in Spring 2019);
 - Previous CfD rounds have included a limit on the MW per project, with Thanet Extension (but not all Tier 2, 3 or 4 projects) falling within that limit; and
 - Post CfD works typically take in excess of 2 years before construction starts.
- 12.3.16 CfD is essentially the method through which certainty is provided regarding the price paid for electricity generated by a project. The most recent CfD round (termed the second round) started on 3rd April 2017, with the outcome posted on 11th September 2017. In reality, a project will not currently progress through to final scheme design without its funding mechanism in place – essentially, without the CfD, there cannot be any certainty that the scheme will actually come forward. Once the project has its CfD in place, it can go through the further steps required before construction can commence. These include Final Investment Decision (FID), contractor procurement, final scheme design etc as well as addressing all the necessary pre-commencement commitments contained within the DCO. Experience has shown these works post CfD award typically take in excess of two years; for example, the CfD for East Anglia ONE was awarded in 2015 and the CfD for Hornsea ONE was awarded in 2014, both of which have only just recently started piling (during Q1 2018). Government announcements currently indicate the next CfD round will occur in Spring 2019.
- 12.3.17 For Tier 2 projects, therefore, there is significant uncertainty regarding the timeframes for construction and the final scheme design, both of which will be heavily influenced by the need for CfD and Final Investment Decision (FID). For Tier 3 and 4 projects, further uncertainty exists as these are pre-consent and/ or pre application projects.
- 12.3.18 Taking these above factors into consideration, even should all these projects achieve consent followed by CfD for the full MW sought in the next CfD round (bearing in mind that Round 2 CfD was capped to a maximum of 1,500 MW for phased projects), it is reasonable to conclude that there is a high degree of certainty that piling at all these projects will not overlap with piling and/ or UXO clearance undertaken at Thanet Extension.
- 12.3.19 Given the extreme uncertainty regarding the potential for the Tier 2, 3 and 4 offshore wind farm projects to come forward in their current form and at a timescale where piling would overlap with UXO clearance and/ or piling activity at Thanet Extension, the in-combination assessment does not attempt to quantify the contribution from these projects and activities to any overall effect.
- 12.3.20 The determination of AEoI for plans and projects in-combination with Thanet Extension in relation to harbour porpoise is determined below.
- The Species potential to remain a Viable Component of the Site*
- 12.3.21 For the purposes of the assessment of AEoI in-combination for harbour porpoise, the methodology applied to the assessment alone for the Conservation Objectives concerned with viability (in relation to potential for injury or mortality), has been extended to consider the potential for effect from the above projects in-combination.
- 12.3.22 As noted above, just one site has been screened in for assessment in relation to harbour porpoise – the SNS cSAC. The assessment presented here therefore relates to the SNS cSAC only.

12.3.23 It has been concluded for Thanet Extension alone that, whilst activities are taking place with associated levels of underwater noise which, if un-controlled, could result in the risk of injurious or even lethal effects on harbour porpoise, given the existing protected nature of these species, embedded mitigation and project commitments (as controlled through the MMMP), the risk of such injurious or lethal effects is appropriately managed. As a result of these existing controls, the type, scale and extent of potential impacts arising from Thanet Extension (and indeed other licenced projects and activities) means that there is no AEoI for harbour porpoise viability (in relation to injury or mortality effects) as a result of the construction, operation and decommissioning of Thanet Extension. The potential for impact is such that it can similarly be concluded (and confirmed within the Screening Matrix (Annex 2, Document Ref: 5.2.2), taking account of the similar controls on all licenced projects and or activities that may result in underwater noise sufficient to result in injurious and or lethal effects on harbour porpoise) that no pathway exists for a contribution to AEoI in-combination from Thanet Extension. The same logic applies to all other projects identified within Table 8.2.

12.3.24 There is, therefore, no AEoI to the viability of harbour porpoise in relation to mortality or injury effects from Thanet Extension in-combination and therefore, subject to natural change, harbour porpoise will be maintained as a 'viable component' of the SNS cSAC in the long-term with respect to the potential for mortality and injury.

12.3.25 The remaining potential for adverse effect on the viability of harbour porpoise within the SNS cSAC therefore relates solely to significant disturbance as a result of underwater noise. Full consideration of the potential for a significant disturbance to result from the project in-combination, sufficient to lead to AEoI, is provided below.

Potential for Significant Disturbance to the Species within the Site

12.3.26 For the purposes of the assessment of AEoI in-combination for harbour porpoise, the methodology applied to the assessment alone for the Conservation Objectives concerned with significant disturbance in harbour porpoise has been extended to consider the potential for effect from the above projects in-combination.

12.3.27 The overall aim of the assessment of disturbance within the SNS cSAC is to identify the percentage of the relevant part of the cSAC within which harbour porpoise may exhibit avoidance behaviour (displacement) together with an understanding of the total duration of disturbance, within the overall construction window. The approach takes account of both spatial and temporal elements, as required by the definition of significance. As the overall construction window falls at least partially within more than one season, the assessment is presented on a seasonal basis – to enable the potential for effect to be fully understood.

12.3.28 The following assessment includes a number of assumptions, with these summarised as follows:

- Only relevant works planned for the period 1st October 2018 - 31st March 2023 (i.e. the winter seasons that fall across the period within which project related construction works at Thanet Extension may result in underwater noise) to be included;
- An assumption that all UXO clearance, geophysical survey and foundation piles at Thanet Extension will be installed within this timeframe;
- Should geophysical survey occur, a 10 km buffer has been applied around the array boundary; and
- The maximum spatial overlap that may occur from an individual UXO clearance or piling location within each project has been assumed (based on a 26 km EDR).

12.3.29 Table 12.4 summarises the potential for effect from a single event (whether that be piling or UXO clearance) per day. The potential effect from piling at more than one foundation location, or more than one UXO clearance, to occur per 24 hours is summarised in Table 11.1.

Table 12.4: Maximum spatial effect in-combination from a single event in a single day per season

Project	Maximum Spatial Effect from a single event within the relevant season in a 24 Hour Period										Relevant Activity
	Winter Season (2018-2019)		Winter Season (2019 - 2020)		Winter Season (2020 - 2021)		Winter Season (2021-2022)		Winter Season (2022 - 2023)		
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	
Thanet Extension (geophysical survey)	370	2.91	370	2.91	370	2.91	X	X	X	X	Unknown timeframe for geophysical survey (if required), but likely to commence prior to UXO clearance
Thanet Extension (UXO)	1,308	10.31	1,308	10.31	1,308	10.31	X	X	X	X	Unknown timeframe for UXO clearance (if required), but likely to commence six months prior to piling.
Thanet Extension (piling)	X	X	X	X	1,308	10.31	1,308	10.31	1,308	10.31	Construction piling. Offshore construction to start 2021
Tier 1											
Borssele 1, 2, 3, 4 & 5			95	0.75	95	0.75					Foundation piling within 2020
Triton Knoll	0	0	X	X	X	X	X	X	X	X	Seismic survey (currently uncertain requirement for, timing and duration but would precede the piling)
Triton Knoll	46	0.17	X	X	X	X	X	X	X	X	UXO clearance (currently uncertain requirement for, timing and duration but would precede the piling)
Triton Knoll	9	0.07	9	0.07	X	X	X	X	X	X	Piling to occur at some point within the construction window of 2017 to 2021; anticipated to be complete by the end of the summer season 2020
Hornsea Project One	0	0	X	X	X	X	X	X	X	X	Percussive piling February 2018 - May 2019
Hornsea Project Two	0	0	0	0	0	0	X	X	X	X	Piling programmed Q1 2018 - Q3 2021

Project	Maximum Spatial Effect from a single event within the relevant season in a 24 Hour Period										Relevant Activity	
	Winter Season (2018-2019)		Winter Season (2019 - 2020)		Winter Season (2020 - 2021)		Winter Season (2021-2022)		Winter Season (2022 - 2023)			
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%		
Maximum total for Tier 1 plus Thanet Extension⁷⁷	1,363	10.55	1,412	11.13	1,403	11.06	1,308	10.31	1,308	10.31		
Tier 2												
Dogger Bank Creyke Beck	A	X	X	X	X	0	0	0	0	0	0	Consent issued but no CFD. Construction window 2021-2024
	B	X	X	X	X	0	0	0	0	0	0	
Dogger Bank Teesside A	X	X	0	0	0	0	0	0	0	0	0	Consent issued but no CFD. Construction window 2020 onwards for 6 years
Sofia	X	X	0	0	0	0	0	0	0	0	0	Consent issued but no CFD. Construction window 2020-2025
East Anglia THREE	X	X	1,827	14.40	1,827	14.40	1,827	14.40	1,827	14.40	14.40	Consent issued but no CFD. Offshore construction would begin in 2020 at the earliest
Tier 3 (None identified)												
Tier 4 (None identified)												

⁷⁷ Note that for Thanet Extension, only piling OR UXO clearance OR geophysical survey can occur in a single 24 hour period – therefore as a worst-case where more than one activity could occur that season, the maximum level for a single activity at Thanet Extension is assumed

Table 12.5: Maximum spatial effect in-combination from multiple events in a single day per season

Project	Maximum Spatial Effect from multiple events within the relevant season in a 24 Hour Period										Relevant Activity
	Winter Season (2018-2019)		Winter Season (2019 - 2020)		Winter Season (2020 - 2021)		Winter Season (2021-2022)		Winter Season (2022 - 2023)		
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%	
Thanet Extension (geophysical survey)	370	2.91	370	2.91	370	2.91	X	X	X	X	Unknown timeframe for geophysical survey (if required), but likely to commence prior to UXO clearance
Thanet Extension (UXO)	1,503	11.84	1,503	11.84	1,503	11.84	X	X	X	X	Unknown timeframe for UXO clearance (if required), but likely to commence six months prior to piling.
Thanet Extension (piling)	X	X	X	X	1,485	11.71	1,485	11.71	1,485	11.71	Construction piling. Offshore construction to start 2021
Tier 1											
Borssele 1, 2, 3, 4 & 5			95	0.75	95	0.75					Foundation piling within 2020
Triton Knoll	0	0	X	X	X	X	X	X	X	X	Seismic survey (currently uncertain requirement for, timing and duration but would precede the piling)
Triton Knoll	46	0.17	X	X	X	X	X	X	X	X	UXO clearance (currently uncertain requirement for, timing and duration but would precede the piling)
Triton Knoll	9	0.07	9	0.07	X	X	X	X	X	X	Piling to occur at some point within the construction window of 2017 to 2021; anticipated to be complete by the end of the summer season 2020
Hornsea Project One	0	0	X	X	X	X	X	X	X	X	Percussive piling February 2018 - May 2019
Hornsea Project Two	0	0	0	0	0	0	X	X	X	X	Piling programmed Q1 2018 - Q3 2021

Project	Maximum Spatial Effect from multiple events within the relevant season in a 24 Hour Period										Relevant Activity	
	Winter Season (2018-2019)		Winter Season (2019 - 2020)		Winter Season (2020 - 2021)		Winter Season (2021-2022)		Winter Season (2022 - 2023)			
	km ²	%	km ²	%	km ²	%	km ²	%	km ²	%		
Maximum total for Tier 1 plus Thanet Extension⁷⁸	1,558	12.08	1,607	12.66	1,580	12.46	1,485	11.71	1,485	11.71		
Tier 2												
Dogger Bank Creyke Beck	A	X	X	X	X	0	0	0	0	0	0	Consent issued but no CFD. Construction window 2021-2024
	B	X	X	X	X	0	0	0	0	0	0	
Dogger Bank Teesside A	X	X	0	0	0	0	0	0	0	0	0	Consent issued but no CFD. Construction window 2020 onwards for 6 years
Sofia	X	X	0	0	0	0	0	0	0	0	0	Consent issued but no CFD. Construction window 2020-2025
East Anglia THREE	X	X	1,880	14.82	1,880	14.82	1,880	14.82	1,880	14.82	14.82	Consent issued but no CFD. Offshore construction would begin in 2020 at the earliest
Tier 3 (None identified)												
Tier 4 (None identified)												

⁷⁸ Note that for Thanet Extension, only piling OR UXO clearance OR geophysical survey can occur in a single 24 hour period – therefore as a worst-case where more than one activity could occur that season, the maximum level for a single activity at Thanet Extension is assumed

12.3.30 Table 12.4 identifies the maximum combined spatial overlap for Tier 1 projects within all winter seasons within which underwater noise during construction may occur at Thanet Extension, assuming that piling is limited to a maximum of a single foundation location per day, with UXO clearance limited to a maximum of a single event per day. Further, it assumes that all activity at Thanet Extension is limited to one per day – i.e. only piling OR UXO clearance OR geophysical survey may occur per day. The in-combination potential for effect with Thanet Extension together with all Tier 1 projects on any given day within any given winter season (as the contribution from Thanet Extension is only applicable during the winter season) is up to 11.13%, during the winter season 2019 - 2020, and therefore remains below the 20% threshold. Although Hornsea Projects One and Two both fall within Tier 1, their location is such that they are more than 26km from the winter extents of the SNS cSAC and their contribution during the winter season is therefore zero.

12.3.31 As demonstrated in Table 12.5, should piling occur at more than one foundation location in a 24 hour period, or UXO clearances be undertaken in locations resulting in the maximum spatial extent of effect on a single day, the 20% threshold will similarly not be exceeded. The maximum that could occur during a winter season would again be during the winter season 2019 - 2020, being up to 12.66% in a single day.

12.3.32 As a consequence, it is concluded that an AEoI will not occur as a result of disturbance to harbour porpoise (as defined by the daily 20% threshold) in-combination with other Tier 1 projects during all relevant winter seasons, within which geophysical survey, UXO clearance and piling activity may take place at Thanet Extension.

In-combination effects on disturbance across a season

12.3.33 As regards the consideration of the potential for an in-combination effect across a season (the 10% value), as for the assessment of the project alone a number of highly precautionary assumptions have been made (following the precedent set by the determination for the project alone in section 11.3). These are summarised below:

- Piling at Thanet Extension assumed to occur at 36 foundation locations wholly within a single six month winter season, assuming (as the worst-case) foundations to be installed individually (i.e. only one foundation per day, requiring 36 days in total), with a maximum spatial effect per day of 10.31%;
- Up to 30 UXO clearances at Thanet Extension on 30 separate days wholly within a single six month winter season, each resulting in a maximum spatial area of effect of 10.31%;
- Geophysical survey at Thanet Extension, with an assumed 10 km buffer and therefore maximum spatial extent of effect of 2.91%, lasting ten days wholly within a single six month winter season;
- Other Tier 1 piling projects – assuming that piling would occur each day of a single winter season, each event resulting in the maximum potential spatial effect; and

- An assumption that all works at Thanet Extension could occur within the same winter season as piling at Triton Knoll (with an assumption that piling would occur every day of that season at Triton Knoll).

12.3.34 The Tier 1 projects Hornsea Project One and Hornsea Project Two screened in for in-combination assessment would only result in spatial effect within the summer seasonal extents of the SNS cSAC only and therefore would not result in an in-combination effect with works at Thanet Extension.

12.3.35 Following the worst-case maximum level of construction outlined above, and assuming that all such works could occur within the same single winter season, the potential for effect when averaged across the season is up to 4.72% and is therefore well below the 10% threshold. It is therefore apparent that capacity exists for additional UXO clearance, or additional days of geophysical survey, to occur at Thanet Extension without exceeding the daily 20% or seasonal 10% thresholds.

Potential for AEoI from disturbance in-combination

12.3.36 It is clear from the information above that neither the 20% value within a 24 hour period nor the 10% threshold of significance across a season will be exceeded by Thanet Extension in-combination with other Tier 1 projects, for any of the relevant winter seasons considered. There is, therefore, no AEoI on harbour porpoise in relation to significant disturbance from Thanet Extension in-combination and, therefore, subject to natural change, in the long-term, there will be no significant disturbance of harbour porpoise.

The Supporting Habitats and Processes Relevant to Harbour Porpoise and their Prey are Maintained

12.3.37 For the purposes of the assessment of AEoI in-combination for harbour porpoise, the methodology applied to the assessment alone for the Conservation Objectives concerned with the supporting habitats of harbour porpoise and their prey, has been extended to consider the potential for effect from the above projects in-combination.

12.3.38 It has been concluded alone and in-combination that there is a lack of pathway linking underwater noise to the habitat characteristics of the seabed and water column, with potential impacts identified on fish receptors being localised, short-term and reversible with harbour porpoise able to exploit similar resources in adjacent undisturbed areas. It can therefore be concluded (and confirmed within the Screening Matrix in Annex 2 (Document Ref; 5.2.2) that there is no potential for LSE for harbour porpoise prey as a result of the construction, operation and decommissioning of Thanet Extension in-combination. The conclusion is supported by Volume 2, Chapter 7: Marine Mammals (Document Ref: 6.2.7) which, in its cumulative assessment for fish ecology, concluded the potential for effect to be not significant at most.

12.3.39 There is, therefore, no AEol to the supporting habitat and processes relevant to harbour porpoise and their prey from Thanet Extension in-combination and therefore, subject to natural change, the availability and density of suitable harbour porpoise prey will be maintained in the long-term.

Potential for an In-combination Effect on Harbour Seal and Grey Seal from Underwater Noise

12.3.40 Table 12.6 below provides further information on the potential for temporal in-combination effects in relation to the above plans and projects screened in for assessment in relation to harbour seal and grey seal only. It should be noted that the location of the projects screened in is such that each project is relevant to a different suite of transboundary sites.

Table 12.6:Temporal overlap with Thanet Extension of plans and projects considered in-combination (harbour seal and grey seal)

Project	Construction window					Relevant Activity
	2019	2020	2021	2022	2023	
Thanet Extension						Seismic survey (currently uncertain requirement for, timing and duration but would precede the piling and UXO clearance) to be undertaken 2019 at the earliest (but 2020 being more likely)
Thanet Extension						UXO clearance (currently uncertain requirement for, timing and duration but would precede the piling, likely to be within 6 months of piling) to be undertaken 2019 at the earliest (but 2020 being more likely)
Thanet Extension						Construction piling. Offshore construction to start in 2021
Tier 1 (Grey shading represents the construction window within which the activity may occur)						
Borssele 1 & 2, 3 & 4, 5						Foundation piling window 2020
Tier 2 (Grey shading represents the construction window within which the activity may occur)						
East Anglia THREE						Consent issued but no CfD. Offshore construction would begin in 2020 at the earliest
Tier 3 (None identified)						
Tier 4 (None identified)						

12.3.41 The potential for the Tier 2 or Tier 4 wind farms to have a construction window that would overlap with Thanet Extension has been discussed above. That extreme uncertainty regarding the potential for any Tier 2 or Tier 4 OWF project to come forward in their current form and at a timescale where piling would overlap with geophysical survey, UXO clearance and/ or piling activity at Thanet Extension means that that no attempt has been made to quantify the contribution from these projects to any overall in-combination effect.

12.3.42 It is of note that the potential for an in-combination effect on harbour seals and grey seals is therefore limited to the Borssele projects, where piling is scheduled for 2020, should that piling at that project occur within the same timeframe as UXO clearance or geophysical survey at Thanet Extension. The potential for an in-combination effect also varies between the transboundary sites screened in for LSE for seals, with some sites lying outside the range of effect, as summarised in Table 12.7.

12.3.43 It is apparent that there is no potential for an AEoI from Thanet Extension in combination with underwater noise associated with Borssele on the harbour seal and grey seal features of the Baie de Canche et couloir des trois estuaires or the Estuaires et littoral picards (baies de Somme et d'Authie). There is similarly no potential for an AEoI from Thanet Extension in combination with underwater noise associated with Borssele on the harbour seal feature of the Recifs Gris-Nez Blanc-Nez or the Ridens et dunes hydrauliques du détroit du Pas-de-Calais. The sites SBZ1, SBZ2 and SBZ3 are screened in for grey seal only.

12.3.44 As for the determination of the potential for AEoI alone, the assessment in-combination is being made against the measures for FCS, as follows:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Table 12.7: Summary of Transboundary Sites Designated for Harbour Seals and Grey Seals Screened in for Assessment In-Combination

Designated Site	Within range of Borssele 1&2, 3&4 5	
	Harbour Seal	Grey Seal
Bancs de Flandres SCI	Yes	Yes
Baie de Canche et couloir des trois estuaires	No	No
Vlakte van de Raan	Yes	Yes
Voordelta	Yes	Yes
Estuaires et littoral picards (baies de Somme et d'Authie)	No	No
Recifs Gris-Nez Blanc-Nez	No	Yes
Vlaamse Banken	Yes	Yes
SBZ1	N/A	Yes
SBZ2	N/A	Yes
SBZ3	N/A	Yes
Ridens et dunes hydrauliques du détroit du Pas-de-Calais	No	Yes

12.3.45 Key to the determination of the potential for an AEol in-combination with Tier 1 projects, with respect to harbour seal and grey seal, are the following points:

- Borssele is situated off the Dutch coast, approximately 90 – 100 km from Thanet Extension and it is therefore extremely unlikely that any project level effects associated with each project would overlap. Further, the timeframe for construction works at Borssele is limited (2020), and there is no certainty regarding if those works would have temporal overlap with works at Thanet Extension;
- The potential for effect from Thanet Extension alone in relation to harbour seals and grey seals is highly limited in terms of the percentage of the overall population of harbour seal and grey seal that may be affected on a temporary and intermittent basis;
- For all projects, if deemed necessary by the project consents, project specific mitigation is anticipated to be required to address issues around species viability (although no certainty can be provided regarding mitigation requirements likely to be implemented in countries other than the UK) and therefore no adverse effect on the viability of harbour seal and grey seal populations are anticipated from Thanet Extension in-combination;
- The short-term and intermittent nature of the underwater noise generated during construction, combined with the limited potential for temporal overlap between Thanet Extension and Borssele, combines to ensure that the natural range of harbour seal and grey seal would not be affected by underwater noise from Thanet Extension in-combination in the long-term; and
- The short-term and temporary nature of such effects mean that the available habitat for harbour seal and grey seal will not be affected in the long-term by underwater noise associated with Thanet Extension in-combination.

12.3.46 There is, therefore, no AEol to the harbour seal and grey seal feature of the transboundary sites in relation to underwater noise during construction from Thanet Extension in-combination with other plans or projects and therefore, subject to natural change, the conservation status of harbour seal and grey seal features will not be affected in the long-term with respect to the potential for underwater noise during construction.

12.4 Offshore Ornithology

12.4.1 A description of the significance of in-combination effects upon the receptors grouped under 'offshore ornithology' is provided below.

Construction and Decommissioning

Offshore cables direct disturbance and displacement

12.4.2 The potential for offshore cables direct disturbance and displacement to result in an AEol in-combination with Thanet Extension relates to the following designated sites and the relevant features:

- Outer Thames Estuary SPA; red-throated diver.

12.4.3 The plans and projects identified with the potential to contribute to an in-combination effect are as follows:

- Nemo Link.

12.4.4 The potential impact of Thanet Extension arising from direct disturbance and displacement during the construction phase (including cable laying) has been considered alone above. Any direct disturbance and displacement in the construction phase will be short-term (temporary) and it is this type of potential impact that has been screened in for in-combination impact assessment together with other offshore cable laying operations on red-throated diver that is the interest feature of the Outer Thames Estuary SPA.

12.4.5 A single cable laying operation has been identified and screened in for the in-combination assessment – Nemo Link. The cable laying operation for this project is currently in progress (2017/18) and is expected to have been completed before Thanet Extension might be under construction.

12.4.6 For a quantitative assessment of the in-combination impacts it requires this project to have published predicted numbers on birds that would be displaced during its construction phase.

12.4.7 The Nemo Link interconnector has been granted consent, with construction underway. The successful application was accompanied by an ES that included a volume on the marine environment (PMSS, 2013) and a chapter on the biological environment that assessed impacts on birds (section 7.2), including offshore birds. The assessment concluded with respect to offshore birds that it "is not likely that the proposed cable installation will have a substantially greater impact on these bird species than the existing shipping already present in this area" (section 7.2.3.1) and did not carry out any quantitative assessment of impacts.

- 12.4.8 In the absence of quantitative information on the Nemo Link interconnector, a qualitative approach to assessment is necessary. Both projects have been assessed – Nemo Link and Thanet Extension – and neither has been assessed as having a significant impact alone with respect to cable laying (although the construction operations alone that relate to Thanet Extension array installation have been screened in for LSE in this RIAA). Accordingly, it is considered highly unlikely that these two projects, even if they were to be implemented at the same time or in close succession, will act in-combination.
- 12.4.9 The Nemo Link interconnector is progressing with the marine cable in UK marine waters over the winter of 2017/18. Thanet Extension array installation and export cable laying are planned, subject to consent, for early in 2021. These project timelines mean that cable laying for Nemo Link will not occur in the same year as Thanet Extension construction, removing such a potential type of in-combination impact. The potential for the successive cable laying operations that occur through sub-tidal waters in to Pegwell Bay in 2017/18 and 2021 to have a significant in-combination impact is also considered unlikely given that they are each of short duration and take place in waters that do not support significant populations of red-throated diver (both cable laying operations avoid the Outer Thames Estuary SPA). It is concluded that the in-combination impact of cable laying operations and Thanet extension construction on red-throated diver will not occur.
- 12.4.10 There is, therefore, no potential for AEoI to the red-throated diver feature of the Outer Thames Estuary SPA in relation to in-combination disturbance and displacement effects and therefore, subject to natural change, red-throated diver will be maintained as a feature in the long-term with respect to the potential for adverse effects from in-combination disturbance and displacement.

Operations and Maintenance

Offshore wind farms direct disturbance and displacement

- 12.4.11 The potential for offshore wind farms direct disturbance and displacement to result in an AEoI in-combination with Thanet Extension relates to the following designated sites and the relevant features:
- Outer Thames Estuary SPA; red-throated diver.
- 12.4.12 An in-combination impact on red-throated diver, which is an interest feature of the Outer Thames Estuary SPA, resulting from Thanet Extension in-combination with other OWFs was screened in for LSE in the Thanet Extension HRA Screening Report (Annex 1 to this report). The HRA Screening Report did not contain a quantitative in-combination assessment.

- 12.4.13 The PEIR Offshore Ornithology chapter (PEIR Volume 2, Chapter 4) did contain a quantitative cumulative assessment of the potential effects of disturbance and displacement on red-throated diver in the UK waters of the North Sea. That cumulative assessment was carried out using published guidance and SNCC advice (JNCC & NE, 2013; King et al., 2009; RenewableUK, 2013; PINS, 2012 and 2015) and followed the practice of ESs submitted by other OWF developers. The methodology applied in that cumulative assessment and the resulting outcomes were discussed with stakeholders in the Evidence Plan meetings held on 2nd October 2017 in relation to the RIAA and on 4th October 2017 in relation to the offshore environment (Evidence Plan Report Doc. Ref, 8.5). After publication of the PEIR, but prior to the deadline for responses to be submitted, a conference call was held with Natural England and the RSPB on 12th December 2017. Attendees from Natural England and the RSPB were provided with a briefing paper about the issues arising from the method by which the cumulative assessment had been carried out and why, as a result, firm reliance could not be placed on its results. Those issues included:

- Some ESs did not assess red-throated diver displacement at all;
- Some ESs did not assess red-throated diver displacement in a quantitative fashion;
- Some ESs applied a buffer that was significantly less than current recommended practice; and
- A number of the OWFs have been built out at a scale that is less than that which was assessed as the worst-case in the ES.

- 12.4.14 A possible resolution of these issues was proposed using a new approach for both the cumulative assessment to inform the EIA and the in-combination assessment to inform the RIAA, aimed at considering Thanet Extension in context relative to other plans and projects. That new approach was to standardise the sources of information, parameters and analysis rather than adopt the different approaches used in different ESs. This standardised approach to the in-combination assessment was supported in principle by Natural England and the RSPB.

- 12.4.15 The standardisation in the method for the in-combination assessment that is presented below included:

- Placing the ‘alone’ contribution of Thanet Extension in context, relative to all other proposed, consented or constructed offshore wind farms, mitigating the false confidence that can arise when considering absolute numbers derived from uncertain sources;
- Applying a single source of red-throated diver density across all the offshore wind farms included in the assessment, this being the density that was modelled for the Seabird Mapping and Sensitivity Tool (SeaMaST) dataset (Bradbury et al., 2014), a copy of which was supplied by Natural England;

- Using GIS to overlay development boundaries on to the red-throated diver density model with those boundaries, where relevant, being the as-built layout of the array or the DCO/dML consented array layout, rather than the worst-case design for the array as assessed in the application and published in the ES;
- Considering the two ends of the range of scenarios over which standardised displacement matrices are prepared, that is a) complete displacement within the OWF and none outside it, and b) complete displacement within the OWF accompanied by complete displacement for a distance of 4 km outside it; and
- Apportioning a percentage of birds to the Outer Thames Estuary SPA where the wind farm is located outside the SPA but functionally linked to it due to its proximity on the basis of the ratio of the population of the SPA (6,466 individuals) to the population of the wider area that was examined in the process of determining the boundary of the SPA (8,132 individuals from O'Brien et al., 2012) where this ratio is 0.795.

12.4.16 Those OWFs screened in for consideration were identified based on geographic proximity. Those OWFs were a) those within the boundary of the Outer Thames Estuary SPA (being the extended SPA boundary, classified in October 2017); and b) those for which the Outer Thames Estuary SPA was the nearest SPA or pSPA with red-throated diver as an interest feature. Those OWFs screened in are listed in Table 12.8, ordered by Tier. Those OWFs further to the north have been attributed to the Greater Wash pSPA, as it is geographically closer, and they do not form part of this in-combination assessment.

Table 12.8: OWFs whose potential displacement effects were attributed to the Outer Thames Estuary SPA

Offshore wind farm	Tier	Location relative to the SPA
Gunfleet Sands	1	Within the OTE SPA
Kentish Flats	1	Within the OTE SPA
Kentish Flats Extension	1	Within the OTE SPA
London Array	1	Within the OTE SPA
Scroby Sands	1	Within the OTE SPA (part)
Galloper	1	Outside of, but functionally linked to OTE SPA
Greater Gabbard	1	Outside of, but functionally linked to OTE SPA
Thanet	1	Outside of, but functionally linked to OTE SPA
East Anglia ONE	2	Outside of, but functionally linked to OTE SPA
East Anglia THREE	3	Outside of, but functionally linked to OTE SPA
Norfolk Vanguard East & West	4	Outside of, but functionally linked to OTE SPA
Thanet Extension	4	Outside of, but functionally linked to OTE SPA

12.4.17 In the process of adding up relative contributions from each OWF, account had to be taken of the fact that when considering adjacent, nearby or extended OWFs there was a possibility that they were being developed within the 4 km buffer of a preceding OWF or that the 4 km buffer of the more recently proposed OWF overlapped with the site of, or the 4 km buffer extending from, a preceding OWF. In such instances, in the assessment scenario that displacement does occur in the 4 km buffer, then 'double-counting' of red-throated diver displacement would occur. This 'double-counting' was avoided in the analysis using GIS by only accounting for the additional contribution made by the subsequent OWF.

12.4.18 The analysis using GIS, of the OWF development boundary overlaps and the red-throated diver density, coupled with the 'tiered' approach to examining OWFs (detailed in Section 8.5) allowed a number of key quantitative comparisons to be made to inform the in-combination assessment.

12.4.19 Table 12.9 and Table 12.10 identify the relative contribution that Thanet Extension makes to the red-throated diver that overall are predicted to be displaced by those OWFs included in the in-combination assessment because they have geographic proximity to the Outer Thames Estuary SPA. This identifies that when the scenario is applied of 100% displacement within each OWF and no displacement outside then the relative contribution that Thanet Extension makes is 0.7%. This increases to 1.5% under the scenario of 100% displacement within each OWF and within a 4 km buffer around each OWF. The large majority (>98%) of the contribution to red-throated diver potential displacement is made by OWFs that have been consented and are already operational (Tier 1).

Table 12.9: The relative contribution of Thanet Extension to the in-combination displacement of red-throated diver within and adjacent to the Outer Thames Estuary SPA, scenario no displacement outside OWF

Offshore wind farms within and adjacent to the OTE SPA summed by Tier Scenario: 100% displacement in OWF, no displacement outside	Relative contribution to RTD potentially displaced
Tier 1: Operational	98.6%
Tier 2: Under construction	0.3%
Tier 3: Consented but not constructed	0.2%
Tier 4: Application in process – other than Thanet Extension	0.2%
Tier 4: Thanet Extension	0.7%

Table 12.10: The relative contribution of Thanet Extension to the in-combination displacement of red-throated diver within and adjacent to the Outer Thames Estuary SPA, scenario 100% displacement in 4 km buffer

Offshore wind farms within and adjacent to the OTE SPA summed by Tier Scenario: 100% displacement in OWF, 100% displacement in 4 km buffer	Relative contribution to RTD potentially displaced
Tier 1: Operational	98.1%
Tier 2: Under construction	0.2%
Tier 3: Consented but not constructed	0.1%
Tier 4: Application in process – other than Thanet Extension	0.1%
Tier 4: Thanet Extension	1.5%

12.4.20 Table 12.11 and Table 12.12 identify the relative contribution that Thanet Extension makes to the proportions of red-throated diver that are predicted to be displaced relative to the Outer Thames Estuary SPA red-throated diver population. This identifies that when the scenario is applied of 100% displacement within each OWF and no displacement outside then the relative contribution that Thanet Extension makes is 0.08% of the Outer Thames Estuary SPA red-throated diver population. This increases to 0.31% under the scenario of 100% displacement within each OWF and within a 4 km buffer around each OWF. The largest contribution made to red-throated diver potential displacement relative to the Outer Thames Estuary SPA red-throated diver population is made by OWFs that have been consented and are already operational (Tier 1).

Table 12.11: The contribution of Thanet Extension to the in-combination displacement of red-throated diver relative to the OTE SPA population, scenario no displacement outside OWF

Offshore wind farms within and adjacent to the OTE SPA summed by Tier Scenario: 100% displacement in OWF, no displacement outside	Contribution to RTD potentially displaced relative to OTE SPA population
Tier 1: Operational	10.2%
Tier 2: Under construction	0.03%
Tier 3: Consented but not constructed	0.02%
Tier 4: Application in process – other than Thanet Extension	0.03%
Tier 4: Thanet Extension	0.08%

Table 12.12: The contribution of Thanet Extension to the in-combination displacement of red-throated diver relative to the OTE SPA population, scenario 100% displacement in 4 km buffer

Offshore wind farms within and adjacent to the OTE SPA summed by Tier Scenario: 100% displacement in OWF, 100% displacement in 4 km buffer	Contribution to RTD potentially displaced relative to OTE SPA population
Tier 1: Operational	21.0%
Tier 2: Under construction	0.05%
Tier 3: Consented but not constructed	0.03%
Tier 4: Application in process – other than Thanet Extension	0.02%
Tier 4: Thanet Extension	0.31%

12.4.21 Displacement may result in the mortality of a proportion of the birds displaced. Definitive mortality rates associated with displacement for any seabird are not known and precautionary estimates have to be used. The approach taken in the assessment of Thanet Extension is to consider a range of mortality rates, for this species the lower limit is 1% mortality resulting from displacement and the upper limit is 5%. This range has been presented at the Evidence Plan meetings and discussed with stakeholders (Evidence Plan Report Doc. Ref. 8.5). The assessment also considers that resultant mortality in the context of the background mortality in the population. The key parameter is the percentage change relative to background mortality in the Outer Thames Estuary SPA red-throated diver population. Table 12.13 and Table 12.14 identify that change for both 1% and 5% resultant mortality. Table 12.13 identifies the change under the scenario of 100% displacement within each OWF and no displacement outside which for Thanet Extension alone is 0.005% and 0.024% for 1% and 5% resultant mortality and for the in-combination set of OWFs potentially affecting the Outer Thames Estuary SPA population is 0.65% and 3.24% respectively. Table 12.14 identifies the change under the scenario of 100% displacement within each OWF and within a 4 km buffer around each OWF which for Thanet Extension alone is 0.020% and 0.098% for 1% and 5% resultant mortality and for the in-combination set of OWFs potentially affecting the Outer Thames Estuary SPA population is 1.34% and 6.69% respectively. The very small percentage change resulting from Thanet Extension alone identifies that the great majority of the contribution to the in-combination percentage change arises from OWFs that have been consented and are already operational (Tier 1).

Table 12.13: Change in background mortality predicted to result from Thanet Extension alone and for the OWFs in or adjacent to the OTE SPA giving rise to 1% or 5% mortality, scenario no displacement outside OWF

Offshore wind farms within and adjacent to the OTE SPA Scenario: 100% displacement in OWF, no displacement outside	Thanet Extension alone	All OWFs affecting OTE SPA
Increase in mortality from background resulting from 1% resultant mortality by displacement	0.005%	0.65%
Increase in mortality from background resulting from 5% resultant mortality by displacement	0.024%	3.24%

Table 12.14: Change in background mortality predicted to result from Thanet Extension alone and for the OWFs in or adjacent to the OTE SPA giving rise to 1% or 5% mortality, scenario 100% displacement in 4 km buffer

Offshore wind farms within and adjacent to the OTE SPA Scenario: 100% displacement in OWF, 100% displacement in 4 km buffer	Thanet Extension alone	All OWFs affecting OTE SPA
Increase in mortality from background resulting from 1% resultant mortality by displacement	0.020%	1.34%
Increase in mortality from background resulting from 5% resultant mortality by displacement	0.098%	6.69%

12.4.22 The in-combination assessment of potential impacts on red-throated diver, considering the displacement relative to the Outer Thames Estuary SPA population and the change in mortality relative to background mortality in the Outer Thames Estuary SPA population has identified that the contribution of Thanet Extension is very small and is considered not to make a material contribution to potential effects arising from OWFs that have been consented and are already operational.

12.4.23 The proposed Thanet Extension does not make a material contribution to in-combination disturbance and displacement to the red-throated diver feature of the Outer Thames Estuary SPA.

12.4.24 There is, therefore, no potential for AEoI to the red-throated diver feature of the Outer Thames Estuary SPA in relation to in-combination disturbance and displacement effects and therefore, subject to natural change, red-throated diver will be maintained as a feature in the long-term with respect to the potential for adverse effects from in-combination disturbance and displacement.

Offshore Wind Farms collision risk

12.4.25 The potential for collision related mortality to result in an AEoI in-combination with Thanet Extension relates to the following designated sites and the relevant features:

- Alde-Ore Estuary SPA; lesser black-backed gull;
- Alde-Ore Estuary Ramsar; lesser black-backed gull;
- Flamborough and Filey Coast pSPA; gannet and kittiwake;
- Flamborough Head and Bempton Cliffs SPA; kittiwake; and
- St Abb’s Head to Fast Castle SPA; kittiwake.

12.4.26 Those sites and the relevant interest features were screened in for LSE prior to the CRM being carried out for the project ‘alone’ and the attribution of the predicted collisions to the relevant European sites. With the project ‘alone’ CRM and attribution having been completed the assessment of potential in-combination impacts can be carried out on a quantitative basis.

12.4.27 Table 12.15 summarises the project ‘alone’ contributions to the relevant SPA, pSPA and Ramsar sites, considering both the number of birds and the percentage addition that such a number of birds makes to baseline mortality of the site population.

Table 12.15: Project ‘alone’ seabird collision contributions to the relevant SPA, pSPA and Ramsar sites

Site	Seabird interest feature	Collision predictions attributed to the site	Addition to baseline mortality of the site (%)
Alde-Ore Estuary SPA	Lesser black-backed gull	1.52 breeding season	0.043 breeding season
Alde-Ore Estuary Ramsar	Lesser black-backed gull	1.52 breeding season	0.104 breeding season
Flamborough and Filey Coast pSPA	Gannet	0.43 spring migration 0.17 autumn migration	0.013 spring migration 0.005 autumn migration
Flamborough and Filey Coast pSPA	Kittiwake	0.43 spring migration 0.17 autumn migration	0.006 spring migration 0.002 autumn migration
Flamborough Head and Bempton Cliffs SPA	Kittiwake	1.56 spring migration 0.41 autumn migration	0.006 spring migration 0.002 autumn migration
St Abb’s Head to Fast Castle SPA	Kittiwake	0.40 spring migration 0.10 autumn migration	0.006 spring migration 0.002 autumn migration

12.4.28 This quantitative assessment based on the attribution of collision predictions to relevant sites has identified that the proposed Thanet Extension does not make a material contribution to in-combination collision risk for any of the sites that have been assessed. Accordingly, it can be concluded that there is no SPA, pSPA or Ramsar site where the proposed Thanet Extension gives rise to an in-combination adverse effect on integrity.

- 12.4.29 The proposed Thanet Extension does not make a material contribution to in-combination collision risk to the lesser black-backed gull interest feature of the Alde-Ore Estuary SPA.
- 12.4.30 The proposed Thanet Extension does not make a material contribution to in-combination collision risk to the lesser black-backed gull interest feature of the Alde-Ore Estuary Ramsar site.
- 12.4.31 The proposed Thanet Extension does not make a material contribution to in-combination collision risk to the gannet interest feature of the Flamborough and Filey Coast pSPA.
- 12.4.32 The proposed Thanet Extension does not make a material contribution to in-combination collision risk to the kittiwake interest feature of the Flamborough and Filey Coast pSPA.
- 12.4.33 The proposed Thanet Extension does not make a material contribution to in-combination collision risk to the kittiwake interest feature of the Flamborough Head and Bempton Cliffs SPA.
- 12.4.34 The proposed Thanet Extension does not make a material contribution to in-combination collision risk to the kittiwake interest feature of the St Abb's Head to Fast Castle SPA.

12.5 Onshore Biodiversity

- 12.5.1 A description of the significance of in-combination effects upon the receptors grouped under 'onshore biodiversity' is provided below.

Construction and Decommissioning

Disturbance (noise & vibration, visual, lighting)

- 12.5.2 Construction of the Richborough Connection has the potential to cause disturbance to European golden plover forming part of the Thanet Coast and Sandwich Bay SPA population. If undertaken at the same time as construction of Thanet Extension there is potential for in-combination effects.
- 12.5.3 A number of embedded mitigation measures are proposed during construction of the Richborough Connection (see Table 12.1). Provided these measures are implemented, given the availability of extensive alternative inland feeding habitat within the vicinity, disturbance during construction would not comprise a likely significant effect (National Grid, 2016). Embedded mitigation implemented during construction and decommissioning of Thanet Extension will avoid disturbance to European golden plover using Pegwell Bay and there will be no AEol (see section 11.5).
- 12.5.4 Although it is possible that in-combination effects can be greater than the effects of the two projects considered alone, in this case there is no potential for significant effects during the sensitive winter period for Thanet Extension. Significant effects outside this period are not likely and there will therefore be no AEol for the Thanet Coast and Sandwich Bay SPA in-combination with the Richborough Connection project.

Disturbance due to possible displacement of visitors from Pegwell Bay Country Park

- 12.5.5 The residential development at Discovery Park, once constructed and occupied, has the potential to increase the number of visitors to Pegwell Bay Country Park. If these additional visitors are using the country park during the construction of Thanet Extension there is potential for them to be displaced to other, more sensitive parts of the Thanet Coast and Sandwich Bay SPA and Ramsar site. A similar effect is also possible during decommissioning, although the level of any displacement is likely to be lower due to the more limited extent of the works. Whether any increase in visitor numbers will have taken place by the time of construction is not known but a precautionary approach has been taken here which assumes that an increase in visitor numbers is possible.
- 12.5.6 Both the Discovery Park development (see Table 12.1) and Thanet Extension (see Table 6.1) include proposals for a range of mitigation measures to reduce the potential for disturbance to non-breeding waterbirds, including qualifying features for the Thanet Coast and Sandwich Bay SPA (European golden plover and ruddy turnstone) and Ramsar site (ruddy turnstone). Following the implementation of the mitigation measures a significant increase in disturbance is not likely and there will be no AEol for either Thanet Coast and Sandwich Bay SPA or Thanet Coast and Sandwich Bay Ramsar.

Operation and Maintenance

Disturbance (noise & vibration, visual, lighting)

- 12.5.7 An assessment of the operational noise of the biomass CHP plant at Discovery Park concluded that operational noise levels would not have a significant effect on the qualifying features for the Thanet Coast and Sandwich Bay SPA and Thanet Coast and Sandwich Bay Ramsar. Similarly, operational noise from the Thanet Extension substation is not likely to have a significant effect (see Volume 3, Chapter 5: Onshore Biodiversity (Document Ref: 6.3.5)).
- 12.5.8 Although it is possible that in-combination effects could be greater than the effects of the two projects considered alone, in this case the intervening distance between the two projects (>1.5 km) means that cumulative noise will not be significant. There will therefore be no AEol for either Thanet Coast and Sandwich Bay SPA or Thanet Coast and Sandwich Bay Ramsar due to operational noise in-combination with the biomass CHP project.

Displacement during O&M

- 12.5.9 Construction of the Richborough Connection has the potential to cause displacement of European golden plover from the fields surrounding the new 400kV line, although given the availability of extensive alternative inland foraging habitat within the wider area, operational displacement would not comprise a likely significant effect (National Grid, 2016). Thanet Extension also has potential to cause limited displacement of European golden plover due to the temporary disturbance of supporting intertidal habitats following planned maintenance works, although there would be no AEol. Noise and visual disturbance during planned maintenance for Thanet Extension will be avoided by the implementation of embedded mitigation measures (Table 6.1).
- 12.5.10 Although it is possible that in-combination effects can be greater than the effects of the two projects considered alone, in this case the potential for effects is very small and any effects from each project will affect very different habitat types. There will therefore be no AEol for the Thanet Coast and Sandwich Bay SPA in-combination with the Richborough Connection project.

13 Transboundary statement

13.1.1 The screening process has identified a number of transboundary sites for assessment, with these sites being as follows (including the relevant designated species screened in):

- Bancs de Flandres SCI (harbour porpoise, harbour seal and grey seal);
- Baie de Canche et couloir des trois estuaires (harbour seal and grey seal);
- Vlakte van de Raan (harbour seal and grey seal);
- Voordelta (harbour seal and grey seal);
- Estuaires et littoral picards (baies de Somme et d'Authie) (harbour seal and grey seal);
- Recifs Gris-Nez Blanc-Nez (harbour seal and grey seal);
- Vlaamse Banken (harbour seal and grey seal);
- SBZ1 (grey seal);
- SBZ2 (grey seal);
- SBZ3 (grey seal);
- Ridens et dunes hydrauliques du détroit du Pas-de-Calais (harbour seal and grey seal);
- ZPS Cap Gris Nez SPA (wintering and breeding birds); and
- ZPS Bancs des Flandres SPA (wintering and breeding birds).

13.1.2 It is of note that all the above sites lie beyond the screening range (20 km) for onshore biodiversity and therefore consideration of the above sites has been focused on the species highlighted above.

13.1.3 Screening of the sites designated for wintering and breeding birds is provided in section 7, with the conclusion being not to screen the sites in (following the approach taken to screening for offshore ornithology in general).

13.1.4 Consideration for an AEoI alone has been addressed in section 11.3 for marine mammals, including in relation to the above sites where marine mammals are highlighted, with all conclusions being no AEoI. The assessment in-combination with other plans or projects (including transboundary projects) has been addressed in section 8 for marine mammals, with all conclusions similarly being no AEoI.

13.1.5 It can therefore be concluded that no AEoI exists for a transboundary effect from Thanet Extension alone or in-combination.

14 Conclusion of the Assessment

- 14.1.1 A summary of the assessment is presented below, firstly identifying in Table 14.1 the designated sites (together with the relevant feature(s)) screened in for effect in relation to Thanet Extension alone, including the conclusion on AEoI. The determination of AEoI in-combination is summarised in Table 14.2.

Table 14.1: Summary of the Potential for Adverse Effect from Thanet Extension Alone

Designated Site	Relevant Features	Potential for Effect	Conclusion on Adverse Effect		
			Construction	Operation	Decommissioning
Sites primarily designated for subtidal and benthic intertidal habitats					
Thanet Coast SAC	Chalk reefs	Temporary habitat loss/ disturbance	No AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
		Increased suspended sediment and associated deposition	No AEol	No AEol	Similar to and potentially less than those outlined in the construction phase.
		Permanent physical habitat loss and temporary habitat disturbance	N/A	No AEol	N/A
		Change in physical processes	N/A	No AEol	N/A
		EMF	N/A	No AEol	N/A
Margate and Long Sands SAC	Sand banks which are slightly covered by sea water all the time	Increased suspended sediment and associated deposition	No AEol	No AEol	Similar to and potentially less than those outlined in the construction phase.
		Change in physical processes	N/A	No AEol	N/A
Thanet Coast & Sandwich Bay SPA – see Onshore Biodiversity					
Thanet Coast & Sandwich Bay Ramsar– see Onshore Biodiversity					
Sites primarily designated for Marine Mammals					
Southern North Sea cSAC	Harbour porpoise	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
Single transboundary site for harbour porpoise: Bancs de Flandres SCI	Harbour porpoise	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
Eight transboundary sites for harbour seal: Bancs de Flandres	Harbour seal	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.

Designated Site	Relevant Features	Potential for Effect	Conclusion on Adverse Effect		
			Construction	Operation	Decommissioning
Baie de Canche et couloir des trois estuaires Vlakte van de Raan Voordelta Estuaires et littoral picards (baies de Somme et d'Authie) Recifs Gris-Nez Blanc-Nez Vlaamse Banken Ridens et dunes hydrauliques du détroit du Pas-de-Calais					
Eleven transboundary sites for grey seal: Bancs de Flandres Baie de Canche et couloir des trois estuaires Vlakte van de Raan Voordelta Estuaires et littoral picards (baies de Somme et d'Authie) Recifs Gris-Nez Blanc-Nez Vlaamse Banken SBZ 1 SBZ 2 SBZ 3 Ridens et dunes hydrauliques du détroit du Pas-de-Calais	Grey seal	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
Sites primarily designated for Offshore Ornithology					
Outer Thames Estuary SPA	Red-throated diver	Disturbance and Displacement	No AEol	No AEol	No AEol
	Common tern Little tern	Collision risk	N/A	No AEol	N/A
Flamborough and Filey Coast pSPA	Guillemot Razorbill	Disturbance and Displacement	No AEol	No AEol	No AEol
	Gannet Kittiwake	Collision risk	N/A	No AEol	N/A

Designated Site	Relevant Features	Potential for Effect	Conclusion on Adverse Effect		
			Construction	Operation	Decommissioning
Northumberland Marine SPA	Guillemot	Disturbance and Displacement	No AEol	No AEol	No AEol
Farne Islands SPA	Guillemot	Disturbance and Displacement	No AEol	No AEol	No AEol
St Abb's Head to Fast Castle SPA	Guillemot Razorbill	Disturbance and Displacement	No AEol	No AEol	No AEol
	Kittiwake	Collision risk	N/A	No AEol	N/A
Foulness (Mid-Essex Coast Phase 5) SPA	Sandwich tern	Collision risk	N/A	No AEol	N/A
Alde-Ore Estuary SPA	Lesser black-backed gull	Collision risk	N/A	No AEol	N/A
Alde-Ore Estuary Ramsar	Lesser black-backed gull	Collision risk	N/A	No AEol	N/A
Flamborough Head and Bempton Cliffs SPA	Kittiwake	Collision risk	N/A	No AEol	N/A
Sites primarily designated for Onshore Biodiversity					
Thanet Coast & Sandwich Bay SPA	Non-breeding European golden plover and ruddy turnstone	Temporary habitat loss/ disturbance of intertidal habitats	No AEol	No AEol	No AEol
		Increased suspended sediment and associated deposition affecting intertidal habitats	No AEol	No AEol	No AEol
		Noise and visual disturbance	No AEol	No AEol	No AEol
		Change to physical processes affecting intertidal habitats	N/A	No AEol	N/A
		Disturbance due to possible displacement of recreational visitors	No AEol	N/A	No AEol
Thanet Coast & Sandwich Bay Ramsar	Non-breeding ruddy turnstone	Temporary habitat loss/ disturbance	No AEol	No AEol	No AEol

Designated Site	Relevant Features	Potential for Effect	Conclusion on Adverse Effect		
			Construction	Operation	Decommissioning
	Wetland invertebrate assemblage	Increased suspended sediment and associated deposition affecting intertidal habitats	No AEol	No AEol	No AEol
		Noise and visual disturbance	No AEol	No AEol	No AEol
		Change to physical processes affecting intertidal habitats	N/A	No AEol	N/A
		Disturbance due to possible displacement of recreational visitors	No AEol	N/A	No AEol

Table 14.2: Summary of the Potential for Adverse Effect from Thanet Extension In-combination

Designated Site	Relevant Features	Potential for Effect	Conclusion on Adverse Effect		
			Construction	Operation	Decommissioning
Sites primarily designated for subtidal and benthic intertidal habitats					
No projects screened in for in-combination assessment and therefore no in-combination effect					
Sites primarily designated for Marine Mammals					
Southern North Sea cSAC	Harbour porpoise	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
Four transboundary sites for harbour seal: Bancs de Flandres Vlakte van de Raan Voordelta Vlaamse Banken	Harbour seal	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
Nine transboundary sites for grey seal: Bancs de Flandres Vlakte van de Raan Voordelta Recifs Gris-Nez Blanc-Nez Vlaamse Banken SBZ 1 SBZ 2 SBZ 3 Ridens et dunes hydrauliques du détroit du Pas-de-Calais	Grey seal	Underwater noise	no AEol	N/A	Similar to and potentially less than those outlined in the construction phase.
Sites primarily designated for Offshore Ornithology					
Outer Thames Estuary SPA	Red-throated diver	Disturbance and Displacement	No AEol	No AEol	No AEol

Designated Site	Relevant Features	Potential for Effect	Conclusion on Adverse Effect		
			Construction	Operation	Decommissioning
Alde-Ore Estuary SPA	Lesser black-backed gull	Collision risk	N/A	No AEoI	N/A
Alde-Ore Estuary Ramsar	Lesser black-backed gull	Collision risk	N/A	No AEoI	N/A
Flamborough and Filey Coast pSPA	Gannet Kittiwake	Collision risk	N/A	No AEoI	N/A
Flamborough Head and Bempton Cliffs SPA	Kittiwake	Collision risk	N/A	No AEoI	N/A
St Abb's Head to Fast Castle SPA	Kittiwake	Collision risk	N/A	No AEoI	N/A
Sites primarily designated for Onshore biodiversity					
Thanet Coast and Sandwich Bay SPA	European golden plover Ruddy turnstone	Disturbance (noise & vibration, visual and lighting) Disturbance due to possible displacement of recreational visitors to Pegwell Bay Country Park Displacement (O&M)	No AEoI	No AEoI	No AEoI
Thanet Coast and Sandwich Bay Ramsar	Ruddy turnstone	Disturbance (noise & vibration, visual and lighting) Disturbance due to possible displacement of recreational visitors to Pegwell Bay Country Park	No AEoI	No AEoI	No AEoI

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