

East Anglia ONE North Offshore Windfarm

Habitat Regulations Assessment (HRA)

**Information to Support Appropriate
Assessment**

Appendix 1: HRA Screening

Document Reference: EA1N-DEVWF-ENV-REP-IBR-
000252

This page is intentionally blank.

East Anglia ONE North Offshore Windfarm

Habitats Regulation Assessment

HRA Screening Report

Document Reference:

EA1N-DEVWF-ENV-REP-IBR-000252

Revision Summary					
Rev	Date	Document Status	Prepared by	Checked by	Approved by
01	15/03/2018	First draft for internal review	Ben King	Alex Hampson	Paolo Pizzolla
01	18/06/2018	First Draft for SPR review	Rosalyn Jones	Alex Hampson	Paolo Pizzolla
02	18/07/2018	Second draft for SPR review	Rosalyn Jones	Alex Hampson	Paolo Pizzolla
03	30/07/2018	Third draft for consultee comments	Kerrie Craig	Alex Hampson	Paolo Pizzolla

Description of Revisions			
Rev	Page	Section	Description
03	All	All	Updated following comments from SPR

Table of Contents

1	Introduction	1
1.1	Purpose of this Document	1
1.2	Project Details	2
1.3	Legislation, Policy and Guidance	11
2	HRA Methodology	14
2.1	HRA Process	14
3	Terrestrial Ecology	19
3.1	Approach to Screening	19
3.2	Screening	20
4	Onshore Ornithology	22
4.1	Approach to Screening	22
5	Benthic Ecology	25
5.1	Approach to screening	25
5.2	Screening	28
6	Fish Ecology	36
6.1	Approach to Screening	36
6.2	Screening	39
7	Marine Mammals	43
7.1	Approach to Screening	43
7.2	Screening	66
8	Offshore Ornithology	88
8.1	Approach to Screening	88
8.2	Screening	94
9	Summary	117
10	References	119

Table of Tables

Table Number	Title
Table 1.1	Indicative Onshore Project Characteristics for the proposed East Anglia ONE North project
Table 2.1	Tiers for Undertaking In-combination Assessment
Table 3.1	Summary of Potential Impacts – Terrestrial Ecology
Table 3.2	Statutory Sites Designated for Terrestrial Ecology within 20km of the Onshore Study Area
Table 4.1	Summary of Potential Impacts – Onshore ornithology
Table 4.2	Statutory Sites Designated for Onshore Ornithology within 20km of the Onshore Study Area
Table 5.1	Summary of Potential Effects - Benthic Ecology
Table 5.2	List of SACs in the southern North Sea with their Respective Categories of Annex I Habitat Interest Feature and Screening Decisions
Table 6.1	Summary of Potential Effects - Fish Ecology
Table 6.2	List of SACs in the southern North Sea with their Respective Categories of Annex II Migratory Fish Species Interest Feature and Screening Decisions
Table 7.1	Summary of Potential Effects – Marine Mammals
Table 7.2	Averaged Magnetic Field Strength Values from AC and DC* cables buried 1m
Table 7.3	List of cSACs SACs, SCIs and SPAs with their Respective Categories of Marine Mammal Interest Feature and Screening Decisions
Table 7.4	Designated sites (where Marine Mammals are a Qualifying Feature) Screened into the HRA for Further Assessment
Table 8.1	Summary of Potential Effects – Offshore Ornithology
Table 8.2	List of SPA and Ramsar Sites with their Respective Categories of Bird Interest Feature and Screening Decisions
Table 8.3	Summary of HRA Screening Assessment for Offshore Ornithology
Table 9.1	Summary of designated sites and interest features screened in

Table of Figures

Figure Number	Title
Figure 1.1	Onshore Indicative Development Area
Figure 1.2	East Anglia ONE North Offshore Development Area
Figure 7.2	Location of the East Anglia ONE North windfarm site and southern North Sea Csac

Glossary of Abbreviations

BEIS	Department for Business, Energy and Industrial Strategy
cSAC	Candidate Special Area of Conservation
DCO	Development Consent Order
East Anglia ONE North	East Anglia ONE North Offshore Windfarm
EC	European Commission
EPP	Evidence Plan Process
ETG	Expert Topic Group
EU	European Union
FCS	Favourable Conservation Status
HRA	Habitats Regulations Assessment
HRGN	Habitats Regulations Guidance Note
IAMMWG	Inter-Agency Marine Mammal Working Group
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
MU	Management Unit
NSER	No Significant Effects Report
OESEA	Offshore Energy Strategic Environmental Assessment
pSAC	Possible Special Area of Conservation
pSPA	Potential Special Protection Area
SAC	Special Area of Conservation
SCI	Sites of Community Importance
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Bodies
SoS	Secretary of State
SPA	Special Protection Area
SPR	ScottishPower Renewables (UK) Limited
UK	United Kingdom
WTG	Wind Turbine Generator
ZAP	Zone Appraisal and Planning
ZEA	Zone Environmental Appraisal
ZTA	Zone Technical Appraisal

Glossary of Terms

Proposed East Anglia ONE North Project	The project to which this Screening Report relates, which includes the offshore windfarm site and offshore export cable corridor.
East Anglia ONE North windfarm site	The offshore area within which wind turbines will be located.
Designated site	A network of nature protection areas in the territory of the European Union. It is made up of Special Areas of Conservation (SAC) and Special Protection Areas (SPA) designated under the Habitats Directive and Birds Directive, respectively. Designated sites also include Sites of Community Importance (SCI) and Candidate SACs (cSACs)
Offshore development area	The East Anglia ONE North offshore windfarm site and offshore export cable corridor area of search.
Offshore export cable corridor	Corridor identified for the installation of the offshore export cables.
Ramsar site	A Ramsar Site is a wetland site of international importance under the Convention on Wetlands, known as the Ramsar Convention

Executive Summary

ScottishPower Renewables (UK) Limited (SPR) is developing the East Anglia ONE North offshore windfarm (the proposed East Anglia ONE North project) and is currently in the process of preparing a Development Consent Order (DCO) application for the project. This document presents the findings of the combined onshore and offshore Habitats Regulations Assessment (HRA) screening exercise, which is stage 1 of the HRA process in support of the proposed East Anglia ONE North project DCO application.

The results of the onshore HRA screening exercise proposes the screening out of all designated sites for all terrestrial ecology receptors based on the proximity of sites being too far from the onshore indicative development area to have the potential to result in Likely Significant Effect (LSE).

The screening exercise for onshore ornithology screened in one designated site and interest feature for further consideration:

- The Sandlings SPA for breeding populations of nightjar and woodlark.

The results of the offshore HRA screening exercise proposes screening out of all designated sites for benthic ecology and fish receptors based on the proximity of sites being too far from the proposed East Anglia ONE North project to have the potential to result in LSE.

The screening exercise for marine mammals screened in three designated sites and interest features for further consideration:

- The Southern North Sea cSAC which is designated for harbour porpoise and overlaps with the East Anglia ONE North windfarm (winter area only).
- The Humber Estuary SAC which is designated for grey seals and is 173 km from the East Anglia ONE North development area at its nearest point.
- The Wash and North Norfolk Coast SAC which is designated for harbour seal and is 97 km from the East Anglia ONE North development area at its nearest point.

The screening exercise for offshore ornithology screened in four designated sites and interest features for further consideration:

- The Outer Thames Estuary SPA and pSPA Extension designated for wintering marine birds and breeding terns which overlaps with the East Anglia ONE North development area.
- The Greater Wash SPA designated for breeding seabirds as well as breeding and wintering passage waterbirds. The site has been screened in due to the potential for small numbers of migratory non-breeding seabirds to pass through the East Anglia ONE North windfarm site.

- The Alde-Ore Estuary SPA and Ramsar which is designated for breeding seabirds as well as breeding, wintering and passage waterbirds. The site has been screened in due to potential connectivity with lesser black-back gull and herring gull populations.
- Flamborough and Filey Coast pSPA which is designated for breeding seabirds. The site has been screened in due to the potential for migrations of seabirds and connectivity with the gannet population during the breeding season.

1 Introduction

1.1 Purpose of this Document

1. This document represents stage 1 of the onshore and offshore HRA process, which supports the proposed East Anglia One North project's DCO application. This Habitats Regulations Assessment (HRA) screening report outlines the HRA process and details the findings of the onshore and offshore HRA screening process for the proposed East Anglia ONE North project.
2. This document will consider whether there is potential for Likely Significant Effect (LSE) on the features of the designated sites to occur due to the presence of onshore and offshore components or activities associated with the proposed East Anglia ONE North project. Where it is considered that there is no potential for LSE, this site will be 'screened out' from further consideration. Where the potential for LSE cannot be discounted for a site, the site will remain 'screened in' and further assessment will be undertaken.
3. This document is to be used to inform stakeholder consultation. Agreement on whether sites should or should not be screened-out will be sought through the Evidence Plan Process (EPP) through the relevant Expert Topic Groups (ETGs).
4. This document considers onshore activities in relation to effects on designated sites and considers the following receptor types:
 - Terrestrial ecology; and
 - Onshore ornithology.
5. This combined HRA screening report also considers offshore activities in relation to effects on designated sites. This screening report considers the following receptor types:
 - Benthic ecology;
 - Fish ecology;
 - Marine mammals; and
 - Offshore Ornithology.
6. It should be noted that SPR is also in the pre-application stage for the 900MW East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project). The proposed East Anglia TWO project will have a separate HRA assessment process, but has been considered in the development of the design of the proposed East Anglia ONE North project. Although separate HRA screening reports have been produced for the proposed East Anglia TWO and East Anglia ONE North projects,

both projects share the same onshore study area and therefore effects on designated sites are likely to be similar.

7. At this stage, it has not been confirmed whether construction of the proposed East Anglia TWO and East Anglia ONE North projects will occur in parallel (i.e. at the same time) or sequentially (construction of one project followed by construction of the second project). Therefore the HRA assessment will have two construction scenarios, construction of both projects in parallel and construction of each project sequentially as these represent the worst case scenarios.

1.2 Project Details

8. This section provides further detail on the infrastructure parameters of the proposed East Anglia ONE North project.
9. Detailed project design will be ongoing throughout the Environmental Impact Assessment (EIA) and pre-construction phase. Therefore, the description of the project provided here is indicative at this stage and designed to provide context for the wider document. The project design envelope will be developed in parallel with the EIA process and will be influenced by the results of environmental and technical studies and in some cases stakeholder consultation.

1.2.1 East Anglia ONE North Onshore Infrastructure

10. For the purpose of the assessment, the key onshore project characteristics are as outlined in **Table 1.1**. Whilst **Table 1.1** below presents the onshore infrastructure required for the East Anglia ONE North project, it should be noted that the additional onshore infrastructure required for the East Anglia TWO project will share the same landfall, cable corridor and substation location.

Table 1.1 Indicative Onshore Project Characteristics for the proposed East Anglia ONE North project

Landfall and Onshore Cable Route	
Number of ducts installed at the landfall (by HDD)	Up to 4
Number of transition bays	Up to 2
Transition bay dimensions	21m (length) x 6m (width) x 1.8m (depth)
Landfall HDD compound dimensions (if required)	175m x 50m
Number of onshore export cables	Up to 6
Onshore cable corridor swathe width	Up to 50.1m
Number cable trenches (between transition bay and onshore substation)	Up to 2

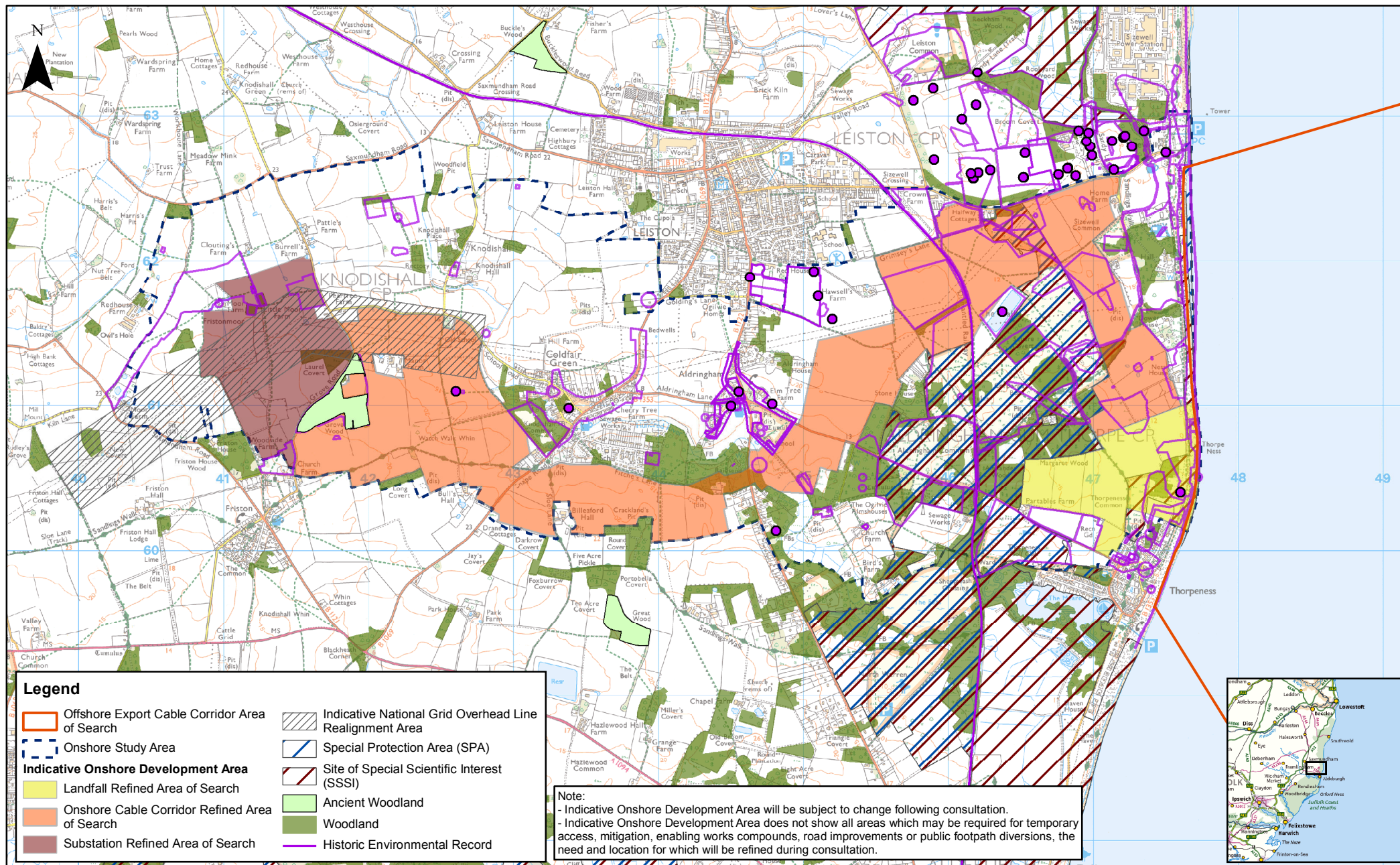
Number ducts installed within onshore cable corridor swathe	Up to 6
Number of underground jointing bays	Dependent upon length of onshore cable route. One required approximately every 500m.
Dimension of jointing bays	15m (length) x 3m (width) x 2m (depth)
Number of link boxes	Dependent upon length of onshore cable route. Two required for every jointing bay.
Dimension of link boxes	1.5m (length) x 1.5m (width) x 1.5m (depth)
Onshore Substation	
Substation operational compound area	190m x 190m
Substation construction compound area (required in addition to the operational footprint)	185m x 50m
Substation buildings height	Up to 15m (outdoor equipment up to 18m)
National Grid infrastructure	
Substation compound area	325m x 140m
Maximum height (excluding pylons)	Up to 16m



11. Further information in relation to the onshore project description and infrastructure is available within the East Anglia ONE North Scoping Report, section 1.5.3 for landfall parameters and section 1.5.4 for infrastructure relating to the cable route and onshore substation.

1.2.2 National Grid Electrical Infrastructure

12. The National Grid infrastructure will include a substation comprising external electrical equipment and gantries. The substation compound will be up to 325 x 140m, with a maximum height of external equipment up to 16m, for both AIS and GIS scenarios.

13. The National Grid infrastructure may also require the upgrade of up to two existing overhead pylons or minor relocation of existing overhead pylons. This will be confirmed with National Grid in on-going design discussions and development.



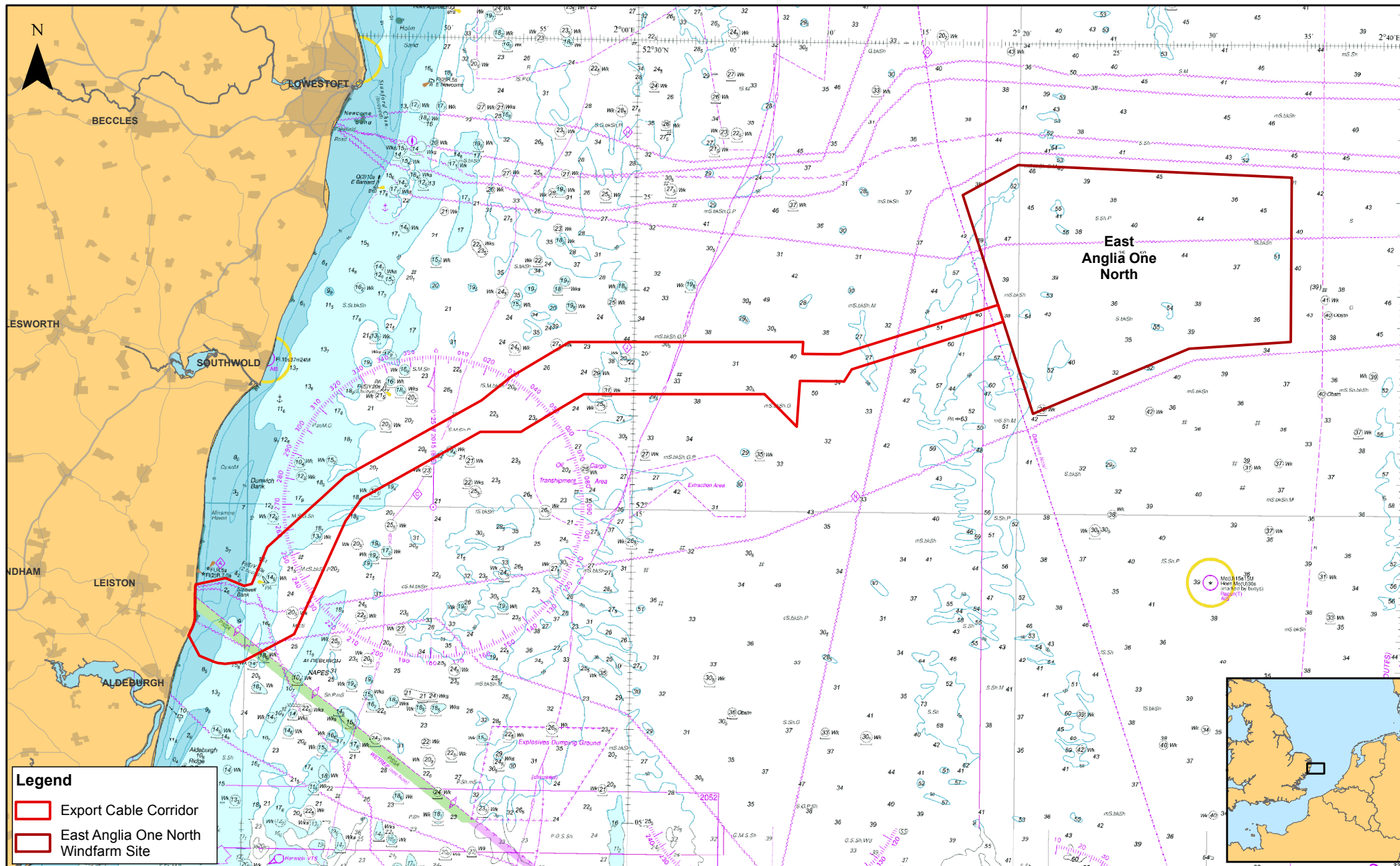
				3 14/05/18 AB Fourth Issue.		1:35,000				East Anglia ONE North and East Anglia TWO				Drg No	EA1N-EA2-DEV-DRG-IBR-00TBC26	
				2 11/05/18 AB Third Issue.		Prepared:	AB			Indicative Onshore Development Area				Rev	3	Coordinate System: BNG Datum: OSGB36
				1 08/05/18 AB Second Issue.		Checked:	PW			- Constraints				Date	14/05/18	
Rev	Date	By	Comment	Approved:	AH	<small>Revised © Natural England, 2016. © Suffolk County Council, 2016. © Crown copyright and database rights 2016. Ordnance Survey 0100031673. This map has been produced to the latest known information at the time of issue, and has been produced for your information only. Please consult with the SPR Offshore GIS team to ensure the content is still current before using the information contained on this map. No liability shall be accepted by us, or our representatives or licensors, for any errors or omissions in the information contained in the map and shall not be liable for any loss, damage or expense caused by such errors or omissions.</small>					Figure	2				

This page is intentionally blank

1.2.3 East Anglia ONE North Offshore Infrastructure

14. The East Anglia ONE North windfarm site (**Figure 1.2**) is approximately 208km² in area and the export cable corridor is 135km². At its nearest point, the East Anglia ONE North windfarm site is 36km from Lowestoft and 42km from Southwold. Within the East Anglia ONE North windfarm site, it is proposed that up to 60 wind turbines with an overall installed capacity of up to 800MW would be installed. Electricity would flow from the wind turbine generators (WTG) via subsea inter-array cables to a number of offshore electrical platforms.
15. Offshore export cables would connect East Anglia ONE North offshore electrical platforms to shore. Offshore export cables would make landfall between Sizewell and Thorpeness in Suffolk.
16. Once the offshore export cables reach the shore, they would be joined to onshore cables via a transition bay near the point of landfall and then to a new onshore substation. From this substation, the proposed East Anglia ONE North project would be connected into the transmission network via a new transmission substation owned and operated by National Grid.

This page is intentionally blank



1	27/04/2018	KO	First Issue.
Rev	Date	By	Comment

Prepared:	KO
Checked:	BK
Approved:	PP

1:300,000
Scale @ A3

Source: © The Crown Estate, 2017. Data provided by MarineFirst, 2017. Charts from MarineFirst Ltd. © Licence No. EN001-0646-MF0005.
Not to be used for navigation.

This map has been produced to the latest known information at the time of issue, and has been produced for your information only.
Please consult with the OPR Offshore GIS team to ensure the content is still current before using the information contained on this map.
To the fullest extent permitted by law, we accept no responsibility or liability (whether in contract, tort (including negligence) or otherwise) in respect of any errors or omissions in the information contained in the map and shall not be liable for any loss, damage or expense caused by such errors or omissions.

East Anglia ONE NORTH

East Anglia ONE NORTH Offshore
Development Area

Drg No	EA1N-DEV-DRG-IBR-000175		
Rev	0	Datum: WGS 1984 Projection: Zone 31N	
Date	27/04/18		
Figure	1		

This page is intentionally blank

1.2.4 Indicative Project Programme

17. The indicative project programme for both the onshore and offshore works are outlined for each phase in the following sections.

1.2.4.1 Construction Programme

18. It is anticipated that onshore works will take approximately 36 months (subject to change). Construction works would be undertaken between 0700 and 1900 Monday to Saturday, with no works on bank holidays or Sundays except in special circumstances¹.

19. It is anticipated that the installation of the offshore elements will take approximately 26 months (subject to change). Construction works would be undertaken 24 hours a day and seven days a week offshore, dependent upon weather conditions.

1.2.4.2 Operations and Maintenance (O&M) Strategy

20. There is no ongoing requirement to maintain the onshore cables following installation. However, periodic access to installed link boxes / test pits may be required for inspection, estimated to be annually. No emissions are anticipated to arise from the onshore cables during operation.

21. The operational emissions from the substation are restricted to light and noise. It is not anticipated that the substation will be illuminated under normal operating conditions. Site lighting will be provided during operations and maintenance activities only, which are anticipated to occur on average once per week during operation.

22. During the operational period, scheduled and unscheduled monitoring and maintenance activities will be required offshore. All offshore infrastructure, including wind turbines, foundations, cables and offshore platforms will be included in monitoring and maintenance programmes. During the 25 years of operation it is likely that some refurbishment or replacement of offshore infrastructure will be required

1.2.4.3 Decommissioning

23. In respect of the onshore infrastructure, no decision has been made regarding the final decommissioning policy for the substation as it is recognised that industry best practice, rules and legislation change over time. However, the substation equipment will likely be removed and reused or recycled. It is expected that the onshore cables, joint pits and ducts will be left in situ. Offshore decommissioning is likely to include the removal of all of the wind turbine components, part of the wind turbine foundations (down to 1m below seabed level), offshore platforms and met mast and

¹ For example where continual work is required such as a concrete pour or HDD bore.

associated foundations and the sections of the inter-array cables close to the offshore structures, as well as sections of the export cables.

24. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator.

1.3 Legislation, Policy and Guidance

1.3.1.1 Overview

25. The HRA process covers features designated under the European Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').

26. It is worth noting that the UK has triggered article 50 of the Treaty of European Union and is currently in the process of withdrawing from the European Union (EU). Following withdrawal from the EU, the UK government plans to enact the Great Repeal Bill. In its white Paper, the UK Government has confirmed that it plans to transpose all current European environmental regulation into UK law after withdrawing from the EU.

1.3.2 European Legislation

1.3.2.1 The Birds Directive

27. The EU Directive on the Conservation of Wild Birds (2009/147/EC) (hereafter called the Birds Directive) provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have been replaced by the Article 6 provisions of the Habitats Directive.

1.3.2.2 The Habitats Directive

28. The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) (hereafter called the Habitats Directive) provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its aim is to maintain or restore natural habitats and wild species at a favourable conservation status. The relevant provisions of the Directive are the identification and classification of Special Areas of Conservation (SAC) (Article 4) and procedures for the protection of SACs and SPAs (Article 6). SACs are identified based on the presence of natural habitat types listed in Annex I and populations of

the species listed in Annex II. The Directive requires national Governments to establish SACs and to have in place mechanisms to protect and manage them.

1.3.3 UK National Legislation

1.3.3.1 The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017

29. These regulations (hereafter the 'Habitat Regulations') together with the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into UK legislation covering terrestrial areas out to and including the UK Offshore Marine Area with the exception of within Scottish territorial waters, where The Conservation (Natural Habitats, &c.) Regulations 1994 continue to apply.

30. The Habitats Regulations place an obligation on 'competent authorities' to carry out an appropriate assessment of any proposal likely to affect a designated site, to seek advice from Natural England and not to approve an application that would have an adverse effect on a designated site except under very tightly constrained conditions that involve decisions by the Secretary of State. The competent authority in the case of the proposed project is the Secretary of State (SoS) for Business Energy and Industrial Strategy (BEIS).

1.3.1 Policy and Guidance

31. In addition to the legislation outlined above, the HRA will give consideration to all relevant guidance and policies issued by a number of Governmental, statutory and industry bodies.

1.3.1.1 Government Guidance

32. In relation to guidance from Government bodies, this includes:

- European Commission: Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites.
- European Commission: EU Guidance on wind energy development in accordance with EU nature directives.
- The Planning Inspectorate Advice Note Nine: Rochdale Envelope.
- The Planning Inspectorate Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects.
- The Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment.
- Department of Energy and Climate Change: Guidelines on the Assessment of Transboundary Impacts of Energy Developments on Natura 2000 Sites outside the UK.

1.3.1.2 Statutory Nature Conservation Bodies (SNCBs) Guidance

33. In relation to guidance from Statutory Nature Conservation Bodies (SNCBs) this includes:

- 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 Likely Significant Effect 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: Advice on HRA screening for seabirds in the 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.

1.3.1.3 Industry Guidance

34. In relation to guidance from industry this includes:

- Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers (King *et al.* 2009).
- Cumulative Impact Assessment Guidelines – Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (RenewableUK 2013).

2 HRA Methodology

2.1 HRA Process

35. The HRA process consists of several phases that are described further below and in Planning Inspectorate Advice Note 10 (Planning Inspectorate, 2016).

2.1.1 Stage 1 – Screening (This Report)

36. In Stage 1, designated and Ramsar sites are screened for LSE, both effects from the project alone and in combination with other projects. Where it can be determined that there is no potential for LSE to occur to interest features of a site, that site is sought to be ‘screened out’.

37. Mitigation, including embedded mitigation, has not been taken into account at Stage 1 HRA Screening, but will be included during the Stage 2 assessment

38. The Planning Inspectorate advises that for those projects where no LSE is predicted then that should be reported in the form of a No Significant Effects Report (NSER) and there is no requirement to undertake the Stage 2 assessment (Planning Inspectorate, 2016).

2.1.2 Stage 1 Screening Process

39. The initial identification of designated and Ramsar sites for inclusion in the Stage 1 HRA Screening is primarily based on the location of the site relative to the proposed East Anglia ONE North project. The approach for each site interest feature is outlined in the **Terrestrial Ecology 3** Terrestrial Ecology, **section 4** Onshore Ornithology, **section 5** Benthic Ecology, **section 6** Fish Ecology, **section 7** Marine Mammals and **section 8** Offshore Ornithology.

40. Screening has been based on a conceptual ‘source-pathway-receptor’ approach. This approach identifies likely environmental effects resulting from the proposed construction, operation and maintenance and decommissioning of the proposed East Anglia ONE North project. The parameters are defined as follows:

- Source – the origin of a potential effect (noting that one source may have several pathways and receptors).
 - Example: cable installation.
- Pathway – the means by which the effect of the activity could impact a receptor.
 - Example: noise from cable installation.
- Receptor – the element of the receiving environment that is impacted.

- Example: presence of a receptor within the direct footprint physical effect or within range of disturbance (e.g. noise or light).
41. Where there is no pathway or the pathway has sufficient distance that the effect from the source has dissipated to a negligible level before reaching the receptor, there is justification for the screening out of that particular receptor.
42. Note that sites will be screened in if, for any one of their qualifying features (i.e. a species or habitat), a source-pathway-receptor relationship and potential for LSE cannot be ruled out. However, each qualifying feature of that site will be considered separately and it may be that the screening process rules out LSE for some features at this stage.
43. Mitigation, including embedded mitigation, has not been taken into account at Stage 1 HRA Screening, but will be included during the Stage 2 assessment.
44. The approach to screening for each receptor is outlined in sections 3-8 and is based on the known distribution, ecology and sensitivities of each receptor group and therefore the potential for being affected by the proposed East Anglia ONE North project.
45. Where there is insufficient information available at this stage to screen out a site, the site is screened in for further consideration.

2.1.3 Stage 2 - Appropriate Assessment

46. The purpose of the HRA process is to identify where potential LSE may occur and to provide information to the competent authority so that they can determine whether LSE is expected to occur through an Appropriate Assessment.
47. For those sites where LSE cannot be excluded in Stage 1, further information to inform the assessment is prepared. The assessment will determine whether the project alone or in-combination could adversely affect the integrity of the site in view of its conservation objectives. The assessment and conclusions of this stage will be reported in the form of a HRA Report and the results of the assessment summarised in the form of a series of matrices.
48. In cases where the HRA Report concludes that an adverse effect on the integrity of a designated or Ramsar site has been identified, the assessment proceeds to Stage 3.

2.1.4 Stage 3 - Assessment of Alternatives

49. Stage 3 investigates alternatives that could be applied to reduce the potential for effects. The Planning Inspectorate advises that alternative solutions can include a proposal of a different scale, a different location and an option of not having the scheme at all - the 'do nothing' approach.

50. If required, information on the consideration of alternatives will be provided.

2.1.5 Stage 4 - Assessment of Imperative Reasons of Overriding Public Interest (IROPI)

51. If it is demonstrated that there are no alternative solutions to the proposal that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a justified case will be prepared that the scheme should be carried out for IROPI.

52. If the conclusion of Stages 3 and 4 is that there is no alternative and that the project has demonstrated IROPI then the project may proceed with a requirement that appropriate compensatory measures are delivered.

2.1.6 In-combination Assessment

53. The Habitats Regulations require that the potential effects of a project on designated sites are considered both alone and in-combination with other plans or projects.

54. The identification of plans and projects to include in the in-combination assessment will be based on:

- Projects that are under construction;
- Permitted application(s) not yet implemented;
- Submitted application(s) not yet determined;
- All refusals subject to appeal procedures not yet determined;
- Projects on the National Infrastructure's programme of projects; and
- Projects identified in the relevant development plan (and emerging development plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.

55. Onshore plans or projects that may be considered include (but are not limited to):

- Other energy generation infrastructure;
- Building and / or housing developments;
- Installation or upgrade of roads;
- Installation or upgrade of cables and pipelines; and
- Coastal protection works.

56. Offshore plans or projects that may be considered include (but are not limited to):

- Offshore windfarms;

- Marine renewables (wave and tidal);
- Port and harbour developments;
- Marine aggregate extraction and dredging;
- Licensed disposal sites;
- Oil and gas exploration and extraction;
- Subsea cables and pipelines; and
- Recreational marine fishing activity.

57. The assessment will present relevant in-combination effects of projects using the tiered approach as devised by Natural England (JNCC and Natural England, 2013a) and presented in **Table 2.1**.

Table 2.1. Tiers for Undertaking In-combination Assessment (based on JNCC and Natural England, 2013a)

Tier Description	Consenting or Construction Phase	Data Availability
Tier 1	Built and operational projects should be included within the cumulative 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 e.g. “background” distribution or mortality rate for birds.	Pre-construction (and possibly post-construction) survey data from the built project(s) and environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the project).
Tier 2	Tier 1 + projects under construction	As Tier 1 but not including post-construction survey data
Tier 3	Tier 2 + projects that have been consented (but construction has not yet commenced)	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the project) and possibly pre-construction
Tier 4	Tier 3 + projects that have an application submitted to the appropriate regulatory body that have not yet been determined	Environmental characterisation survey data from proposed project (including data analysis and interpretation within the ES for the project)
Tier 5	Tier 4 + projects that the regulatory body are expecting an application to be submitted for determination (e.g. projects listed under the Planning Inspectorate programme of projects)	Possibly environmental characterisation survey data (but strong likelihood that this data will not be publicly available at this stage).
Tier 6	Tier 5 + projects that have been identified in relevant strategic plans or programmes (e.g. projects identified in Round 3 wind farm ZAP documents)	Historic survey data collected for other purposes/by other projects or industries or at a strategic level.

- Designated Sites included in HRA

58. The classes of designations considered within this HRA Screening are:

- Special Protection Areas (SPAs; some of which are also Ramsar sites);
- Potential SPA (pSPA);
 - SPAs that are approved by the UK Government but are still in the process of being classified.
- Special Areas of Conservation (SACs);
- Possible SACs (pSACs);
 - A site which has been identified and approved to go out to formal consultation.
- Candidate SACs (cSACs);
 - Following consultation on the pSAC, the site is submitted to the European Commission (EC) for designation and at this stage it is called a cSAC.
- Sites of Community Importance (SCI);
 - Once the EC approves the site it becomes a SCI, before the national government then designates it as a SAC.

59. Consideration is also given to potential effects on Ramsar sites. Ramsar sites protect wetland areas and extend only to “areas of marine water the depth of which at low tide does not exceed six metres”.

3 Terrestrial Ecology

3.1 Approach to Screening

3.1.1 Potential Effects (Source)

60. During construction of the proposed East Anglia ONE North project, activities such as site preparation, cable installation and substation construction may result in direct or indirect (e.g. disturbance from light or noise) effects on terrestrial habitats.

61. During the operational period, the physical presence of the substation will result in the loss or replacement of existing habitats. There may also be indirect effects from lighting and noise. Maintenance activities during the operational phase may also result in localised direct and in-direct effects during works.

62. Decommissioning would require the removal of the substation with other infrastructure likely to be left in situ. Effects caused during decommissioning would be similar to those during the construction phase (although likely to be of lower magnitude).

63. The potential effects on terrestrial ecology from the proposed East Anglia ONE North project have been identified within the East Anglia ONE North Scoping Report (SPR, 2017a) and Scoping Opinion (The Planning Inspectorate, 2017). **Table 3.1** outlines which effects will be considered in relation to terrestrial ecology features within the HRA.

Table 3.1 Summary of Potential Impacts – Terrestrial Ecology (scoped in (✓) and scoped out (x))

Potential Impacts	Construction	Operation	Decommissioning
Direct impacts (permanent and temporary loss) to habitats due to footprint of the onshore works	✓	✓	✓
Direct impacts as a result of fragmentation of habitats due to removal of linear habitats such as hedgerows	✓	✓	✓
Direct and indirect impacts (disturbance / potential killing) to qualifying species	✓	x	✓
Spread of invasive species as a result of construction activities	✓	x	✓
Direct and indirect impacts (noise, lighting) to adjacent habitats and species	✓	✓	✓
Cumulative impacts	✓	✓	✓

3.1.2 Identification of Sites and Features (Pathway and Receptor)

64. Direct or indirect effects on terrestrial habitats and species may arise from permanent or temporary disturbance during the construction of the onshore infrastructure. There is also potential for direct or indirect effects on these receptors during the operational and decommissioning phases of the proposed East Anglia ONE North project.

3.1.2.1 Onshore Habitats

65. A site designated for an onshore habitat interest feature will be screened in through this high level process if:

- A component of the proposed project directly overlaps with the site.
- The distance between the proposed project and the onshore habitat interest feature is within the range for which there could be a likely significant effect e.g. the pathway is not too long for water pollution.

3.1.2.2 Onshore Species (other than birds)

66. A site designated for an onshore species interest feature (other than birds) will be screened in through this high level process if:

- A component of the proposed project directly overlaps with the site.
- The distance between the proposed project and the site with a species interest feature is within the range for which there could be a likely significant effect i.e. the pathway is not too long. In the case of terrestrial species such as bats this will relate to sources of noise, light or physical disturbances.
- The distance between the proposed project and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be a likely significant effect i.e. the pathway is not too long.

3.2 Screening

3.2.1 Project Alone Effects

67. The onshore indicative development area is shown in **Figure 1.1**. At the time of preparing this document, the onshore development area for both the substation and the cable corridor for the proposed East Anglia ONE North project and the National Grid substation are yet to be finalised.

68. Designated sites for terrestrial ecology identified during the desk-based review are listed in **Table 3.2**. These are also shown in **Figure 1.1**.

Table 3.2 Statutory Sites Designated for Terrestrial Ecology within 20km of the Onshore Study Area

Site code	Name	Features	Proximity to onshore study area	Screening decision	Rationale
UK0012809	Minsmere to Walberswick Heaths and Marshes SAC	<ul style="list-style-type: none"> Annual vegetation of drift lines European dry heath Perennial vegetation of stony banks (qualifying feature) No Annex II species 	1.8km	Out	No overlap therefore no direct effect and Beyond the range of potential significant indirect effect
UK0030076	Alde-Ore Estuary SAC	<ul style="list-style-type: none"> Estuaries Atlantic salt meadows Mudflats No Annex II species 	2km	Out	
UK0014780	Orfordness to Shingle Street SAC	<ul style="list-style-type: none"> Coastal lagoons Annual vegetation of drift lines Perennial vegetation of stony banks No Annex II species 	4km	Out	
UK0012741	Staverton Park and the Thicks, Wantisden SAC	<ul style="list-style-type: none"> Old acidophilous oak woods with <i>Quercus robur</i> on sandy plains No Annex II species 	6km	Out	

69. For all sites given that there is no overlap with the onshore study area, there is no potential for direct effects and therefore no potential for LSE. Therefore these sites are screened out with respect to direct effects.

70. For all sites it is considered that given the distance from the onshore study area and the nature of the features themselves (vegetation and coastal habitats) there is no potential for significant indirect effects (e.g. disturbance from noise or light, dust) and therefore no potential for LSE. Therefore these sites are screened out with respect to indirect effects.

3.2.2 In-combination Effects

71. No sites are screened in for project-alone effects; therefore it is considered that there is no pathway for in-combination effects. Therefore all sites are screened out with respect to in-combination effects.

4 Onshore Ornithology

4.1 Approach to Screening

4.1.1 Potential Effects (Source)

72. Note that this assessment only considers sites from the perspective of onshore effects. Offshore effects have been considered in **section 8** Offshore Ornithology.

73. During construction of the proposed East Anglia ONE North project, activities such as site preparation, cable installation and substation construction may result in direct or indirect (e.g. disturbance from light or noise) effects on birds or their supporting habitats.

74. During the operational period, the physical presence of the substation will result in the loss or replacement of existing habitats. There may also be indirect effects from lighting and noise. Maintenance activities during the operational phase may also result in localised direct and in-direct effects during works.

75. Decommissioning would require the removal of the substation with other infrastructure likely to be left in situ. Effects caused during decommissioning would be similar to those during the construction phase (although likely to be of lower magnitude).

76. The potential effects on onshore ornithology from the proposed East Anglia ONE North project have been identified within the East Anglia ONE North Scoping Report (SPR, 2017a) and Scoping Opinion (The Planning Inspectorate, 2017). **Table 4.1** outlines which effects will be considered in relation to ornithological features within the HRA.

Table 4.1 Summary of Potential Impacts – Onshore ornithology (scoped in (✓) and scoped out (x))

Potential Impacts	Construction	Operation	Decommissioning
Direct impacts as a result of fragmentation of habitats	✓	✓	✓
Direct impacts (disturbance / potential killing) to qualifying species	✓	x	✓
Spread of invasive species as a result of construction activities	✓	x	✓
Direct and indirect impacts (noise, lighting) to adjacent habitats and species	✓	✓	✓
Cumulative impacts	✓	✓	✓

4.1.2 Identification of Sites and Features (Pathway and Receptor)

77. A site designated for a bird species feature will be screened in through this high level process if:

- A component of the proposed project directly overlaps with the site.
- The distance between the proposed project and the site with a bird interest feature is within the range for which there could be a likely significant effect on the bird species i.e. this will relate to sources of noise, light etc.
- The distance between the proposed project and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be a likely significant effect i.e. the pathway is not too long

Screening

4.1.3 Project Alone Effects

78. The onshore study area is shown in **Figure 1.1**. At the time of preparing this document, the development area for both the onshore substation and the onshore cable corridor for the proposed East Anglia ONE North project and the National Grid substation are yet to be finalised.

79. Designated sites identified during the desk-based review are listed in **Table 4.2**. These are also shown in **Figure 1.1**.

80. The onshore cable corridor is not fully defined but will run alongside and potentially through the Sandlings SPA. It is considered therefore that there is potential for both direct and indirect effects upon the site during construction.

81. For all other sites given that there is no overlap with the onshore study area, there is no potential for direct effects and therefore no potential for LSE. Therefore these sites are screened out with respect to direct effects.

82. For all other sites it is considered that given the distance from the onshore study area there is no potential for significant indirect effects (e.g. disturbance from noise or light) during any phase of development. This conclusion is based upon Ruddock and Whitfield (2007), which looked at disturbance effects on 26 species of birds (including waterbirds, seabirds, passerines and raptors), at different life history stages. This concluded that, based on expert judgement, disturbance effects for the majority of species were limited to within 1km.

83. In addition, given that the supporting habitats of these sites are wetland, estuarine or intertidal, it is considered that there would be no effect on their birds out with the sites as the habitats affected by the proposed East Anglia ONE North project are arable, woodland etc. There will be no works within the intertidal as landfall will be made via HDD (see **Table 1.1**). Although there is potential for noise disturbance of

birds in the intertidal area from HDD activities, this is not considered to be a pathway for LSE, indeed disturbance of birds within the intertidal was not considered as an effect upon any SPA in the Galloper Wind Farm HRA (Galloper Wind Farm Limited, 2011, The Planning Inspectorate, 2012b). It is therefore considered that there is no potential for LSE. Therefore these sites are screened out with respect to indirect effects.

Table 4.2 Statutory Sites Designated for Onshore Ornithology within 20km of the Onshore Study Area

Designated site	Features	Proximity to onshore study area	Screening decision	Rationale
Sandlings SPA	<ul style="list-style-type: none"> Breeding populations of nightjar and woodlark Woodland and heath 	Within study area	In	Potential for direct and indirect effects during all phases of development
Minsmere to Walberswick SPA	<ul style="list-style-type: none"> Nationally important numbers of breeding and wintering birds Lowland, coastal, floodplain, sandflat and mudflat 	1.8km	Out	No overlap therefore no direct effect and Beyond the range of potential significant indirect effect
Minsmere to Walberswick Ramsar	<ul style="list-style-type: none"> An important assemblage of rare breeding birds associated with marshland and reedbeds 	1.8km	Out	
Alde-Ore Estuary SPA	<ul style="list-style-type: none"> Nationally important numbers of breeding and wintering birds Lowland, estuary, sandflat and mudflat 	2km	Out	
Alde-Ore Estuary Ramsar	<ul style="list-style-type: none"> Notable assemblage of breeding and wintering wetland birds. 	2km	Out	
Deben Estuary Ramsar, SPA	<ul style="list-style-type: none"> Wintering and passage waterbirds. Sandflat, mudflat and estuary 	10km	Out	
Benacre to Easton Bavents SPA	<ul style="list-style-type: none"> Breeding birds Woodland, marsh, estuary and shingle 	19km	Out	
Stour and Orwell Estuaries SPA	<ul style="list-style-type: none"> Wintering and passage waterbirds. Sandflat, mudflat and estuary and lagoons 	19km	Out	
Stour and Orwell Estuaries Ramsar	<ul style="list-style-type: none"> Wintering and passage waterbirds 	19km	Out	

5 Benthic Ecology

5.1 Approach to screening

5.1.1 Site Selection Criteria (Receptor)

84. Direct or indirect effects on benthic habitats may arise from permanent or temporary physical presence of components or plant and/or activities relating to the construction, operation or decommissioning of the windfarm and associated infrastructure.

85. This offshore HRA screening exercise will consider sites which meet the following criteria:

- A component of the proposed East Anglia ONE North project (permanently or temporarily) directly interacts with the site whose interest features include a habitat listed in Annex I of the Habitats Directive; and
- The distance between the proposed East Anglia ONE North project and the interest feature is within a range for which there could be indirect interaction (i.e. within a zone of influence for a physical process change resulting from the proposed East Anglia ONE North project).

5.1.2 Potential Effects (Source)

86. The conservation objective of the Habitats Directive is to “maintain or restore the habitat at a Favourable Conservation Status (FCS)”.

87. The key factors that will be applied during the HRA screening process are:

- Potential effects (source); and
- Proximity of source to the qualifying feature (distance between the proposed development and designated sites) (pathway and receptor).

88. It is recognised that there are six categories of effect which may result in deterioration of benthic habitats within designated sites, either alone or in-combination (JNCC and Natural England, 2013b). These categories have been identified as follows:

- Physical loss;
- Physical damage;
- Non-physical disturbance;
- Toxic contamination;

- Non-toxic contamination²; and
- Biological disturbance³.

89. During construction of the proposed East Anglia ONE North project, activities such as seabed preparation, foundation installation, cable installation and jack-up activities may result in direct or indirect effects on benthic habitats.

90. During the operational period, the physical presence of turbine foundations and associated components (offshore platforms, export cables, inter-array cables) will result in the loss or replacement of existing habitats. Maintenance activities during the operational phase may also result in localised direct and in-direct effects during works.

91. Decommissioning would require the removal of foundation structures and either the cutting or removal of subsea cables, resulting in physical disturbance and the potential for indirect effects associated with suspended sediment. Effects caused during decommissioning would be similar to those during the construction phase.

92. The potential effects on benthic habitats from the proposed East Anglia ONE North project have been identified within the East Anglia ONE North Scoping Report (SPR, 2017a) and Scoping Opinion (The Planning Inspectorate, 2017). **Table 5.1** outlines which effects will be considered in relation to benthic features within the HRA.

Table 5.1 Summary of Potential Effects - Benthic Ecology (scoped in (✓) and scoped out (x))

Potential impacts	Construction	Operation	Decommissioning
Temporary physical disturbance	✓	✓	✓
Permanent habitat loss ⁴	x	✓	✓
Increased suspended sediment concentrations	✓	✓	✓
Re-mobilisation of contaminated sediments	✓	✓	✓
Underwater noise and vibration	✓	x	✓

² For some sites, this includes changes in nutrient and/or organic enrichment and/or salinity.

³ For some sites, this includes the introduction of non-native species and/or the selective extraction of species.

⁴ Within the East Anglia ONE North scoping opinion, PINS highlighted that insufficient evidence was provided within the scoping report to scope out of the EIA permanent habitat loss and colonisation during other phases of the development. However, the MMO has agreed through subsequent Evidence Plan meetings that permanent impacts due to the presence of foundations and scour protection, and the colonisation of structures will be assessed as an operational impact and where it was proposed to leave seabed infrastructure in place after decommissioning (MMO correspondence, 15/05/2018).

Potential impacts	Construction	Operation	Decommissioning
Colonisation of foundations and cable protection ⁴	x	✓	x
Colonisation of foundations and cable protection by Invasive species	✓	✓	✓
Potential impacts on sites of marine conservation importance	✓	✓	✓
Impact of Electromagnetic Fields.	x	✓	x
Cumulative permanent habitat loss ⁴	x	✓	✓
Cumulative changes to seabed habitat characteristics	✓	✓	✓
Transboundary impacts	x	x	x

5.1.3 Identification of sites and features (Pathway)

93. Designated sites with benthic habitats listed under Annex I of the Habitats Directive as interest features have been considered in this screening exercise.

94. The spatial extent of this screening report includes sites in the southern North Sea which includes sites within 750km of the East Anglia ONE North offshore development area (**Table 5.2**). Impacts to benthic habitats are restricted to physical direct and indirect effects at a relatively localised scale and it is proposed that there is no potential pathway for impacts to sites in the wider North Sea or beyond. As it has been agreed through the scoping process that transboundary effects are scoped out for EIA (given the distance to sites in other Member States jurisdictions) these have also been screened out from consideration for HRA purposes.

95. Consideration for sites within the southern North Sea is based on the sensitivities of site specific interest features (receptors) and whether there is a potential pathway for habitats to receive direct or indirect effects (source). Potential impacts to benthic habitats from the proposed East Anglia ONE North project are generally considered small scale and localised, and are mainly driven by physical disturbance to the seabed, or localised effects on physical processes.

96. The significance of effects on the habitats will be derived from their sensitivity to the received impact. This will include temporary and permanent change and the ability of the interest feature to withstand or recover from change.

97. Annex I habitats, for which designated sites are designated, are:

- Sandbanks which are slightly covered by sea water all the time;
- Estuaries;

- Mudflats and sandflats not covered by seawater at low tide;
- Coastal lagoons;
- Reefs;
- Large shallow inlets and bays;
- Submarine structures made by leaking gases; and
- Submerged or partially submerged sea caves.

98. It has been reported that some benthic species may react to episodic and high intensity noise, which may include the type of noise typically generated by piling activities (Lovell *et al*, 2005, Heinisch and Weise, 1987). However, Annex I habitats for which designated sites are designated are not known to have any noise sensitivity; therefore, noise effects will not be considered criteria for screening-in effects on benthic habitats.

5.2 Screening

5.2.1 Project Alone Effects

99. This section screens the potential for LSE from the proposed East Anglia ONE North project alone.

100. There are 15 designated sites within the southern North Sea (not already screened out as transboundary) which have benthic features as primary reasons for designation or qualifying features.

101. There are no SACs designated for benthic features within the footprint of the East Anglia ONE North offshore development area, therefore there are no sites that will be directly impacted during construction, operation or decommissioning. Therefore, no sites are screened in for direct effects this includes permanent habitat loss, EMF effects and colonisation.

102. Indirect impacts to benthic features from sites outside the East Anglia ONE North offshore development area could arise from deposition of sediment suspended during construction works or from other effects on physical processes. To determine if there is potential for indirect effects upon any site it is necessary to determine whether there is a pathway for effect and the potential zone of influence.

103. In response to comments raised by Cefas (regarding potential cumulative effects on wave climate) SPR has undertaken modelling (SPR, 2018). Cefas were concerned that the combined impact on wave climate from the presence of offshore structures may result in a 5% or greater change in current wave conditions, and this in turn may result in changes such as increased erosion rates at sensitive receptors.

104. The individual project modelling for the proposed East Anglia ONE North project comprised of runs for 1 in 1 year and 1 in 50 year return period events from each of three directions, namely north, north-northeast and east.
105. Modelling of the effects on baseline wave height considered increases in wave height caused by reflection, and decreases in wave height as a result of wave sheltering. Under all conditions, the results indicated larger changes to the 1 in 1 year baseline than the 1 in 50 year baseline.
106. Under a northerly wave direction, reflection and wave sheltering effects largely cancelled each other out and changes to wave height baseline are predicted to be within $\pm 0.5\%$. For waves approaching from the north-north east, effects on waves were over a larger range; however, changes were less than $\pm 1\%$ and did not impinge on nearby projects. Modelling of waves to the east, which have a lower baseline wave height in general, showed wave sheltering in a shoreward direct. However, the zone of effect does not reach the shore and is reported as less than $\pm 1\%$.
107. Therefore, under all wave directions modelled, the zone of effects from the proposed East Anglia ONE North project are small resulting in changes in baseline wave height of less than $\pm 1\%$ and therefore not significant. It is therefore considered no SACs could be affected as a result of changes in the wave climate.
108. Sediment transport modelling was undertaken for the East Anglia ONE offshore windfarm and cumulatively for the former East Anglia Zone. As the sites have similar depths and sedimentary conditions, results from East Anglia ONE physical processes modelling were agreed to be relevant and therefore used to inform the East Anglia THREE EIA and HRA (SPR, 2015) and Norfolk Vanguard PEI (Vattenfall, 2017). It is also considered that this modelling would be appropriate for the project-alone screening for the proposed East Anglia ONE North project given the similar environmental conditions (i.e. depths and sediment conditions, SPR, 2017a).
109. East Anglia ONE and Zonal (SPR, 2012) modelling demonstrated that coarse sediment would settle out rapidly where disturbed (or dredged) and that indirect far-field effects would be limited to within 1km of the works and for the duration of 1 tidal cycle. For finer materials it was predicted that deposition could occur at up to 50km from the source, however, the deposited sediment layer across the wider seabed was found to be generally less than 0.2mm thick and did not exceed 2mm. Further information to support these findings in relation to the proposed East Anglia ONE North project has been provided to MMO, Cefas and NE through the Evidence Plan Process and in the supporting document 'East Anglia ONE North and East Anglia TWO Wave Modelling Report, Appendix D (SPR, 2018).
110. Of the 15 sites screened in to this assessment, only four sites are within 50km of the East Anglia ONE North windfarm site and offshore export cable corridor;

- Alde, Ore and Butley Estuaries SAC (3.4km);
- Orfordness - Shingle Street SAC (3.8km)⁵;
- Haisborough, Hammond and Winterton SAC (22km); and
- Margate and Long Sands SCI (37km).

111. There are no sites within 1km of the East Anglia ONE North offshore development area (where most of sediment deposition would be expected to occur) and any deposition beyond this point is expected to be minimal. It is therefore considered no SACs could be affected as a result of changes in sediment deposition.

112. On this basis that there is no potential for direct or indirect effects which could result in LSE, we propose to screen all SACs with benthic habitat interest features out of the HRA.

113. **Table 5.2** provides the results of the HRA screening process.

⁵ The primary feature of the Orfordness- Shingle Street SAC is a series of percolation lagoons which are separated from the marine environment by the Orford shingle beach. These features are described as non-marine as they occur landward of highest astronomical tide. Therefore, due to a physical barrier there is no pathway between the source of any effects in the marine environment and the receptor

Table 5.2 List of SACs in the southern North Sea with their Respective Categories of Annex I Habitat Interest Feature and Screening Decisions

Site Code	Country	SAC name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N Windfarm	Cable corridor		
UK0030076	UK	Alde, Ore and Butley Estuaries SAC	H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide	54	3.4	Out	Within range of theoretical indirect effect (sediment deposition) for cable corridor but effect negligible. Features are primarily sedimentary
UK0030368	UK	Bassurelle Sandbank SAC	H1110 Sandbanks which are slightly covered by sea water all the time	203	173	Out	Beyond the range of potential impact.
UK0017072	UK	Berwickshire and North Northumberland Coast SAC	H1150 Coastal lagoons H8330 Submerged or partially submerged sea caves	414	409	Out	Beyond the range of potential impact.
UK0030357	UK	Braemar Pockmarks SAC	H1180 Submarine structures made by leaking gases	737	747	Out	Beyond the range of potential impact.
UK0013690	UK	Essex Estuaries SAC	H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide	107	73	Out	Beyond the range of potential impact.
UK0013036	UK	Flamborough Head SAC	H8330 Submerged or partially submerged sea caves	240	235	Out	Beyond the range of potential impact.

Site Code	Country	SAC name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N Windfarm	Cable corridor		
UK0013107	UK	Thanet Coast SAC	H1110 Sandbanks which are slightly covered by sea water all the time 1140 Mudflats and sandflats not covered by seawater at low tide H1170 Reefs	118	89	Out	Beyond the range of potential impact.
UK0030369	UK	Haisborough, Hammond and Winterton SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1170 Reefs (<i>Sabellaria spinulosa</i>)	22	35	Out	Within range of theoretical indirect effect (sediment deposition) for cable corridor but effect negligible. Features are primarily sedimentary
UK0030170	UK	Humber Estuary SAC	H1130 Estuaries H1140 Mudflats and sandflats not covered by seawater at low tide H1110 Sandbanks which are slightly covered by sea water all the time H1150 Coastal lagoons	179	173	Out	Beyond the range of potential impact.

Site Code	Country	SAC name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N Windfarm	Cable corridor		
UK0030370	UK	Inner Dowsing, Race Bank and North Ridge SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1170 Reefs	119	110	Out	Beyond the range of potential impact.
UK0030371	UK	Margate and Long Sands SCI	H1110 Sandbanks which are slightly covered by sea water all the time	69	37	Out	Within range of theoretical indirect effect (sediment deposition) for cable corridor but effect negligible. Features are primarily sedimentary
UK0030358	UK	North Norfolk Sandbanks and Saturn Reef SCI	H1110 Sandbanks which are slightly covered by sea water all the time H1170 Reefs	62	69	Out	Beyond the range of potential impact
UK0014780	UK	Orfordness - Shingle Street SAC	H1150 Coastal lagoons	54	3.8	Out	The primary feature of the SAC is a series of percolation lagoons which are separated from the marine environment by the Orford shingle beach. These features are described as non-marine as they occur

Site Code	Country	SAC name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N Windfarm	Cable corridor		
							landward of highest astronomical tide. Therefore, due to a physical barrier there is no pathway between the source of any effects in the marine environment and the receptor.
UK0030354	UK	Scanner Pockmark SAC	H1180 Submarine structures made by leaking gases	657	666	Out	Beyond the range of potential impact.
UK0017075	UK	The Wash and North Norfolk Coast SAC	H1110 Sandbanks which are slightly covered by sea water all the time H1140 Mudflats and sandflats not covered by seawater at low tide H1160 Large shallow inlets and bays	105	97	Out	Beyond the range of potential impact.

* Distance measured from the closest point of East Anglia ONE North to the closest point of the designated site rounded to the nearest kilometre

5.2.2 In-combination Effects

114. There are no direct effects on any SAC from the proposed East Anglia ONE North project; therefore there is no pathway for LSE from in-combination effects.
115. Indirect effects from sediment deposition would only occur during construction and the potential for in-combination effects would only occur if projects were constructed at the same time. In addition, effects at each site would be small scale and highly localised as for the proposed East Anglia ONE North project alone. It is therefore considered that there is no pathway for LSE from in-combination sediment deposition effects.
116. As discussed in **section 5.2.1**, Cefas were concerned that the combined impact on wave climate from the presence of offshore structures may result in a 5% or greater change in current wave conditions, which could result in changes such as increased erosion rates at sensitive receptors.
117. The cumulative wave modelling considered Hornsea Project 1, Project 2 and Project 3, East Anglia ONE, East Anglia THREE, the proposed East Anglia TWO project, Norfolk Vanguard, Norfolk Boreas, Galloper and Gabbard windfarms and the proposed East Anglia ONE North project. The modelling showed that there would be some cumulative effects as a result of interactions between the proposed East Anglia ONE North project, the proposed East Anglia ONE North project and Galloper and Gabbard, however, effects outside of the footprint of the proposed East Anglia ONE North project were less than 2% of baseline conditions, and therefore within the 5% threshold that is considered a significant impact. It is therefore considered no SACs could be affected as a result of changes in the wave climate.
118. On the basis that there is no potential for direct or indirect in-combination effects which could result in LSE, we propose to screen all SACs with benthic habitat interest features out of the HRA.

5.2.3 Benthic Ecology Screening Summary

119. On the basis that there is no potential for direct or indirect in-combination effects which could result in LSE on any site, either for the proposed East Anglia ONE North project alone or in-combination, we propose to screen all SACs with benthic habitat interest features out of the HRA.

6 Fish Ecology

6.1 Approach to Screening

6.1.1 Site Selection Criteria (Receptor)

120. Direct or indirect effects on Annex II migratory fish species may arise from the permanent or temporary physical presence or activities relating to the construction, operation or decommissioning of the windfarm and associated infrastructure. Potential effects include loss of habitat, disturbance and displacement.

121. This HRA screening exercise considers sites which meet the following criteria:

- The offshore development area directly overlaps a site whose interest features includes an Annex II migratory fish species;
- The distance between the offshore development area and a site with a fish interest feature is within the range for which there could be an interaction e.g. the pathway is not too long for sediment deposition;
- The distance between the offshore development area and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be an interaction i.e. the pathway is not too long; and
- The likelihood that a foraging area or a migratory route occurs within the zone of influence of the offshore development area.

6.1.2 Potential Effects (Source)

122. The key factors that will be considered during the HRA screening process are:

- Potential effects (source); and
- Proximity of source to feature (distance between the proposed development and SACs, migration routes) (pathway and receptor).

123. Natural England have issued the following conservation objectives for the Humber Estuary SAC which has migratory fish listed as an interest feature. These are presented as an example of the objectives for a typical site.

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
 - The extent and distribution of qualifying natural habitats and habitats of qualifying species;

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

124. The above conservation objectives will be used as the basis of identifying potential LSE within this screening exercise.

125. During construction of the proposed East Anglia ONE North project, activities which result in disturbance to the seabed and the generation of suspended sediment have the potential to disturb and displace fish from supporting habitats or migratory routes. Underwater noise generated by construction activities, such as piling, also has the potential to displace fish from supporting habitats or migratory routes by acting as a barrier.

126. During the operational period, the physical presence of turbine foundations and associated components (offshore platforms, export cables, inter-array cables) will result in the loss or replacement of existing habitats. Maintenance activities during the operational phase may also result in localised disturbance or displacement.

127. Decommissioning would require the removal of foundation structures and either the cutting or removal of subsea cables resulting in physical disturbance, potential disturbance and displacement of impacts associated with suspended sediment and underwater noise. Effects caused during decommissioning would be similar to those during the construction phase.

128. The potential effects on fish and associated important habitats from the proposed East Anglia ONE North project have been identified within the East Anglia ONE North Scoping Report (SPR, 2017a) and Scoping Opinion (The Planning Inspectorate, 2017). These are provided in **Table 6.1**.

Table 6.1 Summary of Potential Effects - Fish Ecology (scoped in (✓) and scoped out (x))

Potential Effects	Construction	Operation	Decommissioning
Physical disturbance and temporary loss of sea bed habitat, spawning or nursery grounds during intrusive works	✓	x	✓
Permanent habitat loss	x	✓	x
Increased suspended sediments and sediment re-deposition	✓	✓	✓
Re-mobilisation of contaminated sediment during intrusive works	✓	✓	✓
Underwater noise impacts to hearing sensitive species during foundation piling	✓	x	x
Underwater noise impacts to hearing sensitive species due to other activities (vessels, seabed preparation, cable installation etc.)	✓	✓	✓
Introduction of wind turbine foundations, scour protection and hard substrate	x	✓	x
Electromagnetic fields	x	✓	x
Changes in fishing activity	x	✓	x
Cumulative underwater noise	✓	✓	✓
Cumulative permanent habitat loss	x	✓	x
Cumulative (in-combination) changes to seabed habitat	✓	✓	✓
Transboundary impacts	x	x	x

6.1.3 Identification of sites and features (Pathway)

129. Atlantic salmon *Salmo salar*, allis shad *Alosa alosa*, twaite shad *Alosa fallax* and sea lamprey *Petromyzon marinus* are known to either migrate through or spend part of their lifecycle in the North Sea. Therefore, there is the potential for migratory fish to be present in the vicinity of the proposed East Anglia ONE North project.
130. This screening report considers all designated sites within the southern North Sea which have migratory fish species listed in Annex II of the Habitats Directive as an interest feature.
131. Disturbance to supporting habitats due to permanent installation of components or due to temporary works are expected to be localised. Sediment plumes and changes to seabed characteristics are expected to be restricted to the vicinity of the offshore development area. Displacement of fish species from migration routes or

supporting habitats may occur due to underwater noise, particularly piling activity for which effects may occur at up to 40km from the East Anglia ONE North windfarm site.

132. Sites will be screened in or screened out based on the proximity of those sites to the windfarm sites and the sensitivities of species within those sites.

6.2 Screening

6.2.1 Project Alone Effects

133. It was agreed as part of the East Anglia ONE North Scoping Report (SPR, 2017) that transboundary impacts on fish would be scoped out of the EIA. We have therefore screened them out from consideration in the HRA.
134. There are no UK sites designated for Atlantic salmon, allis shad and twaite shad in the Southern North Sea. Therefore there is no pathway for direct effects upon the sites themselves. Although there is theoretical potential for individuals from other UK sites beyond the Southern North Sea to be in the vicinity of the proposed East Anglia ONE North project, it is considered that there is no potential for significant effects upon them as the absence of designated sites in the area reflects its lack of importance to the species. Therefore no sites are screened in to the assessment for these species either alone or in-combination.
135. There are two non-transboundary designated sites within the southern North Sea region which have Annex II fish species as features as primary reasons for designation or qualifying features. These are the Humber Estuary SAC and the River Derwent SAC in North Yorkshire (which flows into the Humber). The features are the Sea lamprey *Petromyzon marinus* (and the River lamprey *Lampetra fluviatilis* which is restricted to coastal waters), see **Table 6.2**. The Humber Estuary SAC, is 179km away from the East Anglia ONE North windfarm site and 173km from the offshore export cable corridor.
136. At this distance, there would be no pathway for physical interaction, either directly or indirectly, with the SACs themselves. Relatively little is known about the precise habitats occupied by adult sea lampreys and although adults are sometimes caught at sea, the precise conditions in which they occur have not been described. Most adults are found in freshwater and spawning and larval stages occur in rivers (Maitland, 2003). Given the distance from the SACs, and the mostly freshwater life history of the species it is unlikely that there would be any effects from the proposed East Anglia ONE North project on this species.
137. Based on the approach set out in section 6.1, it is concluded that there is no potential for LSE from the proposed East Anglia ONE North project on the Humber

Estuary SAC and, therefore, it is proposed that it not be considered further in the HRA.

138. **Table 6.2** presents the findings of the HRA screening exercise with justification for scoping individual sites out.

Table 6.2 List of SACs in the southern North Sea with their Respective Categories of Annex II Migratory Fish Species Interest Feature and Screening Decisions

Site Code	Country	SAC name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK0030170	UK	Humber Estuary SAC	1095 Sea Lamprey** 1099 River lamprey**	179	173	Out	River lamprey are restricted to rivers and coasts so there can be no direct interaction with the proposed East Anglia ONE North project.
UK0030253	UK	River Derwent SAC	1099 River lamprey*	274	268	Out	Sea lamprey could in theory be present in the vicinity of the proposed East Anglia ONE North project, but given their life history interaction would be limited. The distance between the proposed project and the site precludes direct impact upon the site and its supporting habitats.

*Primary feature

**Qualifying feature

6.2.2 In-combination Effects

139. As there are no pathways for effects due to the project, there are no pathways for in-combination effects.

6.2.3 Fish Ecology Screening Summary

140. On the basis that there is no potential for direct or indirect effects which could result in LSE on any site, for the proposed East Anglia ONE North project alone or in-combination, we propose to screen all SACs with Annex II fish species interest features out from the HRA.

7 Marine Mammals

7.1 Approach to Screening

7.1.1 Site Selection Criteria (Pathway)

141. For marine mammals, the approach to HRA screening primarily focuses on the potential for connectivity between individual marine mammals from designated sites and the proposed East Anglia ONE North project (i.e. demonstration of a clear source-pathway-receptor relationship). This is based on the distance of the offshore development area from the designated site, the range of each effect and the potential for animals from the designated site to be within range of an effect.

142. This HRA screening exercise therefore considers designated sites which meet the following criteria:

- The distance between the potential effect of the proposed East Anglia ONE North project and a designated site with a marine mammal interest feature is within the range for which there could be an interaction e.g. the pathway is not too long for significant noise propagation;
- The distance between the offshore development area and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be an interaction i.e. the pathway is not too long; and / or
- The likelihood that a foraging area or a migratory route occurs within the zone of influence of the offshore development area (applies to mobile interest features when outside the SAC).

143. Therefore, the key factors that will be considered during the HRA screening process are:

- Potential effects (source); and
- Proximity of source to feature (distance between the proposed development and cSACs/SACs, migration routes) (pathway and receptor).

7.1.2 Potential Effects (Source)

144. Direct or indirect effects to marine mammals may arise from permanent or temporary physical presence or activities relating to the construction, operation or decommissioning of the proposed East Anglia ONE North project and associated offshore infrastructure. Potential effects include indirect effects through impacts on prey species and direct effects from underwater noise and vessel interactions.

145. The potential effects on marine mammals from the proposed East Anglia ONE North project were identified within the East Anglia ONE North Scoping Report (SPR, 2017a) and discussed in the Scoping Opinion (The Planning Inspectorate, 2017). These are summarised in *Table 7.1*.

Table 7.1 Summary of Potential Effects – Marine Mammals (scoped in (✓) and scoped out (x))

Potential Effects	Construction	Operation	Decommissioning
Underwater noise during UXO clearance	✓	x	x
Underwater noise during piling	✓	x	x
Underwater noise from vessels and other activities, such as seabed preparations, cable installation and rock dumping	✓	✓	✓
Underwater noise from operational wind turbines	x	✓	x
Barrier effects from underwater noise	✓	✓	✓
Barrier effects from physical presence of turbines	x	x	x
Water quality caused by disturbance of sediment	✓	✓	✓
Electromagnetic fields (EMF) ⁶	x	x	x
Vessel interactions (collision risk)	✓	✓	✓
Disturbance at seal haul-out sites ⁷	x	x	x
Changes to prey resources	✓	✓	✓
In-combination effects of underwater noise	✓	✓	✓
In-combination effects of vessel interactions (collision risk)	✓	✓	✓
In-combination effects of changes to prey resources	✓	✓	✓

⁶ Agreement has been made with NE, MMO, TWT and WDC through the Evidence Plan Process, via a marine mammals Expert Topic Group meeting on the 19th of March that potential impacts on marine mammals from EMF have been screened out.

⁷ Justification for scoping out disturbance to seal haul-out sites has been provided to Natural England and The Wildlife Trust following a Marine Mammals evidence plan meeting on the 19th of March and summarised in Section 7.1.4.2.3 and Section 7.1.4.3.3 below. NE have agreed that disturbance to seal-haul outs can be scoped out, although consideration is required in relation to foraging areas. Section 5.1.4.2.3 and Section 5.1.4.3.3 below. NE have agreed that disturbance to seal-haul outs can be scoped out, although consideration is required in relation to foraging areas.

146. In the Scoping Opinion (The Planning Inspectorate, 2017), PINS stated that insufficient evidence was presented to scope out two potential impacts. They confirmed that they would be content for these impacts to be scoped out of the assessment if further evidence was presented and the conclusions agreed with relevant stakeholders. Therefore, the following sections present the evidence to scope out:

- **Section 7.1.2.1** potential effects of EMF; and
- **Section 7.1.2.2** physical barrier effects.

147. This also provides the basis to screen out consideration of these impacts from the HRA.

7.1.2.1 Screening out of any potential effects from EMF

148. Normandeau *et al.* (2011) modelled expected magnetic fields using design characteristics taken from a range of subsea cable projects. For eight of the ten AC cables modelled it was found that the intensity of the magnetic field (B) was approximately a direct function of voltage (ranging from 33kV to 345kV) although separation between the cables and burial depth also influenced field strengths. Similarly, the modelling carried out for nine DC cables also found that the B field was a function of voltage (ranging from 75 to 500kV) and cable configuration. For both AC and DC cables, the predicted B fields were strongest directly over the cables and decreased rapidly with vertical and horizontal distance from the cables (**Table 7.2**).

Table 7.2 Averaged Magnetic Field Strength Values from AC and DC* cables buried 1m (Normandeau *et al.*, 2011)

Distance (m) above seabed	Magnetic Fields Strength (µT)					
	Horizontal distance (m) from cable					
	0m AC	0m DC*	4m AC	4m DC*	10m AC	10m DC*
0	7.85	78.27	1.47	5.97	0.22	1.02
5	0.35	2.73	0.29	1.92	0.14	0.75
10	0.13	0.83	0.12	0.74	0.08	0.46
*DC cables are not being considered for East Anglia TWO or East Anglia ONE North projects.						

149. For the proposed East Anglia ONE North project all inter-array and offshore export cables will be AC. Cables would be buried to a target depth of greater than 1m. Where substrate conditions prevent burial, and at cable or pipeline crossings, cable protection would be deployed. Any effect would therefore be limited to the immediate vicinity of the cables (i.e. within metres), attenuating rapidly.

150. Although it is assumed that harbour porpoise are capable of detecting small differences in magnetic field strength, this is unproven and is based on circumstantial information. There is also, at present, no evidence to suggest that existing subsea cables have influenced cetacean movements. Harbour porpoise move in and out of the Baltic Sea with several crossings over operating subsea HVDC cables in the Skagerrak and western Baltic Sea without any apparent effect on their migration pattern (Walker, 2001). There is no evidence that pinnipeds respond to electromagnetic fields (Gill *et al.*, 2005).

151. Data from operational windfarms show no evidence of exclusion of harbour porpoise or seals from within the windfarm (for example, Diederichs *et al.*, 2008; Lindeboom *et al.*, 2011; Marine Scotland, 2012; McConnell *et al.*, 2012; Russell *et al.*, 2014; Scheidat *et al.*, 2011; Teilmann *et al.*, 2006; Tougaard *et al.*, 2005, 2009a, 2009b) and therefore effects of EMF have been scoped out. Agreement of scoping out of EMF has been reached through the Evidence Plan Process and is consistent with recent assessments such as the East Anglia THREE EIA (SPR, 2015) and Norfolk Vanguard PEI (RHDHV 2017) which only considered impacts on EMFs on prey species.

7.1.2.2 Screening out of barrier effects from the physical presence of turbines

152. The presence of a windfarm could be seen as having the potential to create a physical barrier, preventing movement or migration of marine mammals between important feeding and / or breeding areas, or potentially increasing swimming distances if marine mammals avoid the site and go round it. The East Anglia ONE North windfarm site is not located on any known migration routes for marine mammals.

153. The minimum spacing between wind turbines will be 1,980m x 1,210m. This means that animals can be expected to move between devices and through the operational windfarm irrespective of layout.

154. Data from operational windfarms show no evidence of exclusion of harbour porpoise or seals from within the windfarm (for example, Diederichs *et al.*, 2008; Lindeboom *et al.*, 2011; Marine Scotland, 2012; McConnell *et al.*, 2012; Russell *et al.*, 2014; Scheidat *et al.*, 2011; Teilmann *et al.*, 2006; Tougaard *et al.*, 2005, 2009a, 2009b), which indicates that turbines do not present a physical barrier.

155. Both harbour porpoise and seals have been shown to forage within operational wind farm sites (e.g. Lindeboom *et al.*, 2011; Russell *et al.*, 2014) indicating no restriction to movements in operational offshore wind farm sites.

7.1.3 Summary of Potential Effects

156. The following potential effects during construction, operation, maintenance and decommissioning are considered in the HRA process:

- Underwater noise, including UXO clearance, piling and other construction activities, vessels, operation and maintenance activities, operational turbines and decommissioning activities;
- Vessel interactions (increased collision risk);
- Changes to water quality;
- Changes to prey resources; and
- Any in-combination effects of (i) underwater noise; (ii) vessel interactions; and (iii) changes to prey resources.

7.1.4 Identification of sites and features (Receptor and Pathway)

157. Based on data collected during aerial surveys and a review of existing data sources (summarised in SPR, 2017a, SPR, 2017b), the Annex II species likely to occur in the proposed East Anglia ONE North project and, therefore, considered in the HRA screening are:

- Harbour porpoise *Phocoena phocoena*;
- Grey seal *Halichoerus grypus*; and
- Harbour seal *Phoca vitulina*.

158. Bottlenose dolphin *Tursiops truncatus*, the only other Annex II marine mammal species, has not been positively identified during the aerial surveys of the East Anglia ONE North windfarm site surveys (based on 20 months of data) or 24 months of aerial data for the East Anglia ONE and East Anglia THREE EIAs. During SCANS-III surveys in summer 2016, no bottlenose dolphins were recorded in or around the area of East Anglia ONE North (Hammond *et al.*, 2017). Taking into account that no sightings have been recorded in and around the East Anglia ONE North windfarm site, bottlenose dolphin will not be considered further in this assessment.

159. The following sections (**sections 7.1.4.1 to 7.1.4.3**) describe the process used to define the list of designated sites for which there is theoretical connectivity and, therefore, potential for a source – pathway – receptor relationship for harbour porpoise, grey seal and harbour seal.

7.1.4.1 Harbour Porpoise

160. Harbour porpoise within the eastern North Atlantic are generally considered to be part of a continuous biological population that extends from the French coastline of the Bay of Biscay to northern Norway and Iceland (Tolley and Rosel, 2006; Fontaine

et al., 2007, 2014; IAMMWG, 2015). However, for conservation and management purposes, it is necessary to consider this population as smaller Management Units (MUs). MUs provide an indication of the spatial scales at which effects of plans and projects alone, and in-combination, need to be assessed for the key cetacean species in UK waters, with consistency across the UK (IAMMWG, 2015). The Inter-Agency Marine Mammal Working Group (IAMMWG) defined three MUs for harbour porpoise: North Sea (NS); West Scotland (WS); and the Celtic and Irish Sea (CIS). East Anglia ONE North is located within the North Sea MU (**Plate 7.1**; IAMMWG, 2015). Therefore, all designated sites out with the North Sea MU have been screened out from further consideration.

161. For harbour porpoise, connectivity is considered potentially possible between the proposed East Anglia ONE North project and any designated site within the North Sea MU, where the species is considered as a grade A, B or C feature⁸.

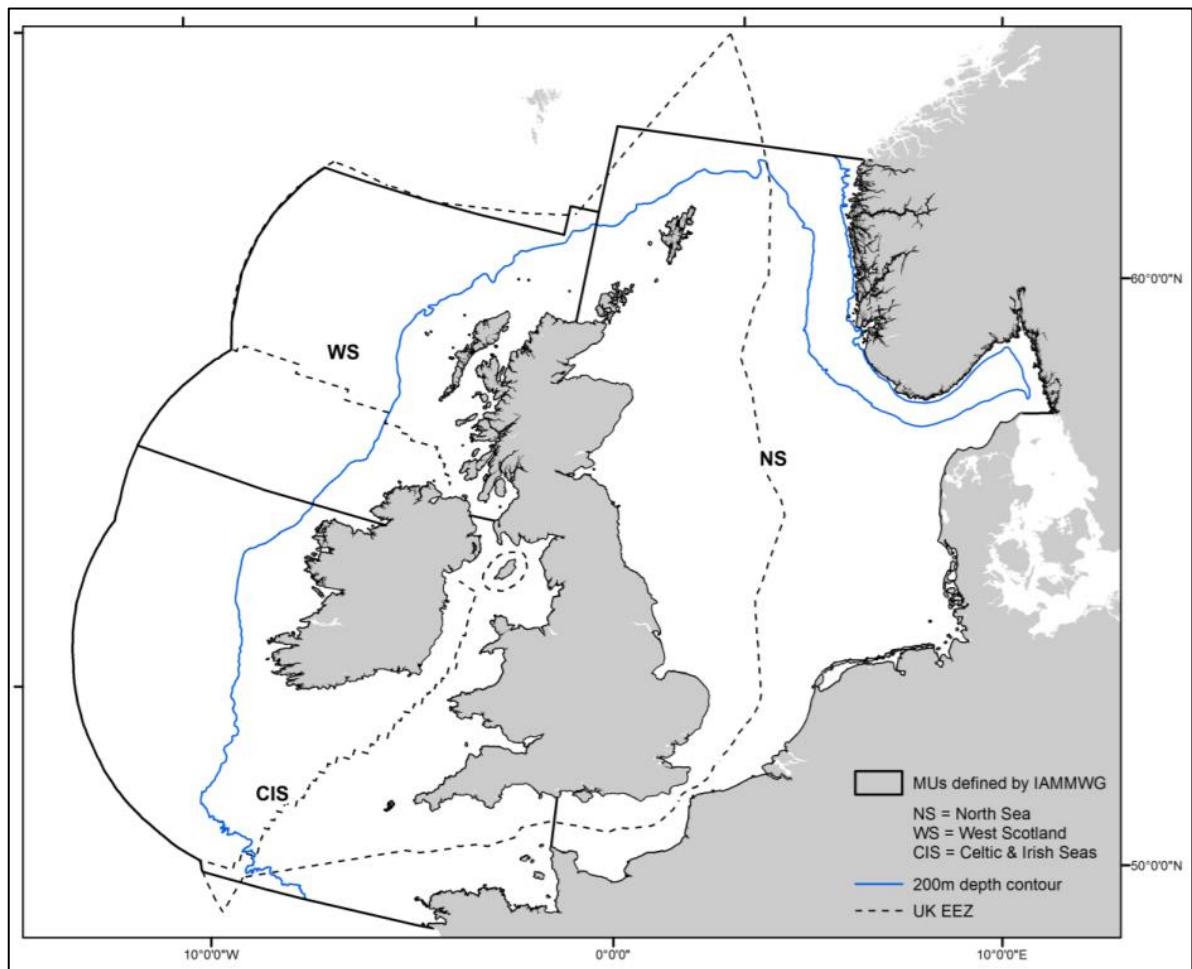


Plate 7.1: Harbour porpoise Management Units (IAMMWG, 2015)

⁸ Grade D indicates a non-significant population (JNCC, 2009)

162. **Table 7.3** shows a list of designated sites considered to have potential connectivity to the offshore development area. This list has been further refined and screened, in relation to the potential effects assessed below.

7.1.4.1.1 Underwater Noise

163. Marine Mammal Mitigation Plans (MMMPs) for unexploded ordnance (UXO) clearance and piling will be produced post-consent in consultation with relevant stakeholders and will be based on the latest scientific understanding and guidance, and detailed project design. The MMMP will contain measures that will reduce the risk of any lethal injury, physical injury or permanent auditory injury to harbour porpoise as a result of underwater noise during piling, such as the application of best practice mitigation at the time of construction. The commitment to the MMMP reduces the risk of lethal injury, physical injury and permanent auditory (PTS) injury. The HRA will assess the potential effects of any lethal injury, physical injury and permanent auditory (PTS) injury, taking into account embedded mitigation and the MMMPs.

164. The current SNCB advice is that a distance of 26km from an individual percussive piling location should be used to assess the area of the Southern North Sea cSAC habitat harbour porpoise may be disturbed from during piling operations (JNCC, 2017a, 2017b). This is based on the effective deterrent radius (EDR) for a single monopile of 26km (Tougaard *et al.*, 2013). 26km is also the advised disturbance range from UXO initiation.

165. This advice should be relevant for all cSAC sites. Therefore, all designated sites with the exception of the Southern North Sea cSAC are screened out with regard to noise impacts as all sites are greater than 26km from the East Anglia ONE North windfarm site (**Table 7.3**).

166. The proposed East Anglia ONE North project is located within the Southern North Sea cSAC winter area and partially overlaps with the summer area (**Figure 7.2**). Therefore, any harbour porpoise affected by underwater noise from East Anglia ONE North would be within or in close proximity to the Southern North Sea cSAC.

167. As harbour porpoise are wide-ranging within the North Sea MU, no discrete population can be assigned to an individual designated. It is, therefore, assumed that at any one time, harbour porpoise within or in the vicinity of the offshore development area are associated with the Southern North Sea cSAC (as they cannot simultaneously be part of the population of multiple designated sites, although all are part of the larger MU population). Therefore, with regard to the potential effects of underwater noise at the East Anglia ONE North windfarm site connectivity of harbour porpoise from other designated sites, other than the Southern North Sea cSAC is screened out (**Table 7.3**).

168. The potential effects of underwater noise during construction of the proposed East Anglia ONE North project alone that have the potential for LSE on the SNS cSAC and will be assessed further are:

- Potential risk of any permanent auditory injury (PTS) resulting from the underwater noise associated with clearance of UXO;
- Potential disturbance resulting from the underwater noise associated with clearance of UXO;
- Potential risk of any permanent auditory injury (PTS) resulting from the underwater noise during piling (single and concurrent);
- Potential disturbance resulting from underwater noise during piling (single and concurrent);
- Potential disturbance resulting from underwater noise during other construction activities, for example, seabed preparation, rock dumping and cable installation;
- Potential disturbance resulting from underwater noise from vessels; and
- Potential barrier effects as a result of underwater noise during construction.

169. The potential effects of underwater noise during the operation and maintenance of the proposed East Anglia ONE North project alone that have the potential for LSE on the SNS cSAC and will be assessed further are:

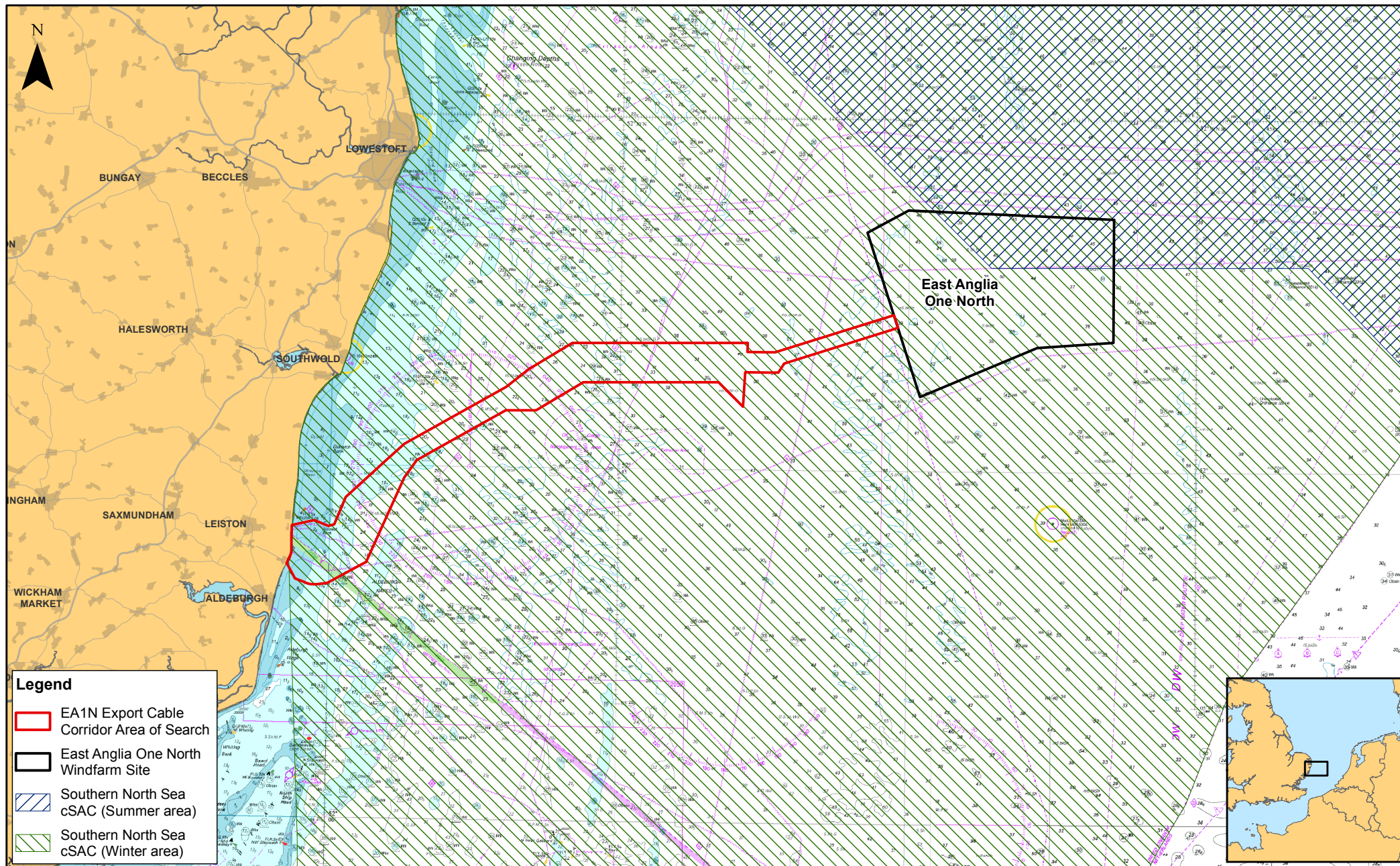
- Potential disturbance resulting from operational turbines;
- Potential disturbance resulting from underwater noise during maintenance activities, for example, any additional rock dumping and cable re-burial;
- Potential disturbance resulting from underwater noise from vessels; and
- Potential barrier effects as a result of underwater noise during operation and maintenance.

170. The potential effects of underwater noise during decommissioning of the proposed East Anglia ONE North project alone that have the potential for LSE on the SNS cSAC and will be assessed further are:

- Potential disturbance resulting from the noise associated with foundation removal (e.g. cutting);
- Potential disturbance resulting from underwater noise from vessels; and
- Potential barrier effects as a result of underwater noise during decommissioning.

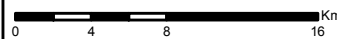
171. The potential in-combination effects of disturbance from underwater noise will include:

- Offshore windfarm piling;
- UXO clearance;
- Seismic surveys;
- OWF construction activities (other than piling), including vessels; and
- Operational offshore windfarms including maintenance activities and vessels.



				Prepared:	KO
1	27/04/2018	KO	First Issue.	Checked:	BK
Rev	Date	By	Comment	Approved:	PP

1:400,000
Scale @ A3



Source: © The Crown Estate, 2017. © JNCC and Natural England, 2018. Data provided by MarinePro, 2017. Charts from MarinePro.co.uk
© Licence No EX001-0645-MF/0056. Not to be used for navigation.
This map has been produced to the best of our knowledge and belief at the time of issue, and has been produced for your information only.
Please consult with the appropriate authorities before using the information contained in this map.
The data used in this map is derived from a variety of sources and is subject to change without notice. We accept no responsibility for any loss, damage or expense caused by any errors or omissions in the information contained in the map and shall not be liable for any loss, damage or expense caused by such errors or omissions.

East Anglia ONE NORTH

East Anglia ONE NORTH- Southern North Sea cSAC

Drg No	EA1N-DEV-DRG-IBR-000174	
Rev	0	Datum: WGS 1984 Projection: Zone 31N
Date	27/04/18	
Figure	5.1	

This page is intentionally blank

7.1.4.1.2 Vessel Interactions

172. It is likely that during construction, vessels will use regular routes between ports and the offshore development area which will allow marine mammals to become accustomed to vessels, in order to reduce any increased collision risk. Additionally, vessel operators will use good practice and common sense to reduce any risk of collisions with marine mammals.

173. Vessel activity will be concentrated in the vicinity of the offshore development area (beyond this, vessel activity will be dispersed and becomes part of the background vessel traffic, using already established vessel routes). Therefore, all animals affected would be within or in close proximity to the Southern North Sea cSAC. As outlined above, it is considered that all harbour porpoise in the area of the offshore development area are associated with the Southern North Sea cSAC and therefore all designated sites, with the exception of the Southern North Sea cSAC, are screened out with regard to any potential vessel interactions (**Table 7.3**).

174. Applying the same approach, the in-combination assessment will also only consider the Southern North Sea cSAC.

7.1.4.1.3 Changes to water quality

175. Disturbance of seabed sediments has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. The accidental release of contaminants (e.g. through spillage) also has the potential to effect water quality. There is the potential for increased suspended sediments. Any potential changes to water quality in the East Anglia ONE North windfarm site will be considered further in the HRA.

176. As outlined above it is assumed that at any one time, harbour porpoise foraging in the proximity of the proposed project are associated with the Southern North Sea cSAC (see **section 7.1.4.1.1**). As a result, connectivity with harbour porpoise from other designated sites which are foraging within the impact range of any changes to water quality is screened out for all sites, with the exception of the Southern North Sea cSAC.

7.1.4.1.4 Changes to Prey Resources

177. Preliminary site specific underwater noise modelling (ITAP, 2018, unpublished) indicates that noise impacts upon fish will be limited to less than 40km from a piling event⁹. Therefore, given that all designated sites with the exception of the Southern

⁹ That is for possible behavioural effects (based on Popper *et al.* (2014) temporary threshold shift (TTS) criteria of 186dB SEL for 15m monopile with maximum hammer energy of 4,000kJ)

North Sea cSAC are greater than 40km from the proposed East Anglia ONE North project, direct effects upon prey resources of all these sites are screened out (**Table 7.3**).

178. As stated above it is assumed that at any one time, harbour porpoise foraging in the proximity of the proposed East Anglia ONE North project are associated with the Southern North Sea cSAC (see **section 7.1.4.1.1**). As a result, connectivity with harbour porpoise from other designated sites which are foraging within the impact range of indirect changes to prey resource is screened out for all sites, with the exception of the Southern North Sea cSAC.
179. Applying the same approach, the in-combination assessment will also only consider the Southern North Sea cSAC.

7.1.4.2 Grey Seal

180. For grey seal, the screening process considers any designated site where the species is a grade A, B or C feature and there is the potential for connectivity between grey seals from the designated site and the offshore development area (i.e. demonstration of a clear source-pathway-receptor relationship).
181. Grey seals are wide ranging and can breed and forage in different areas (Russell *et al.*, 2013). For example, tags deployed on grey seals at Donna Nook and Blakeney Point in May 2015, indicated that they used multiple haul-outs sites; with one hauling out in the Netherlands and one in Northern France (Russell, 2016). **Plate 7.3** shows the tagged seal movements along the east coast of England and indicates that grey seal travel between haul-out sites along the east coast of England, as well as to the north of France and up to the Firth of Forth and across Fladden Ground and Dogger Bank (Russell, 2016).
182. Grey seals will typically forage in the open sea and return regularly to land to haul-out, although they may frequently travel up to 100km between haul-out sites. Foraging trips generally occur within 100km of their haul-out sites, although grey seal can travel up to several hundred kilometres offshore to forage (SCOS, 2017). Grey seal generally travel between known foraging areas and back to the same haul-out site, but will occasionally move to a new site. Movements have been recorded between haul-out sites on the east coast of England and the Outer Hebrides (SCOS, 2017).
183. To take the wide range and movements of grey seal into account, all designated sites in the Greater North Sea OSPAR region (**Plate 7.4**) were considered. All designated sites out with this region were screened out from further consideration.

184. **Table 7.3** shows a list of designated sites considered to have potential connectivity to the proposed East Anglia ONE North project. This list has been further refined and screened, in relation to the potential effects assessed below.

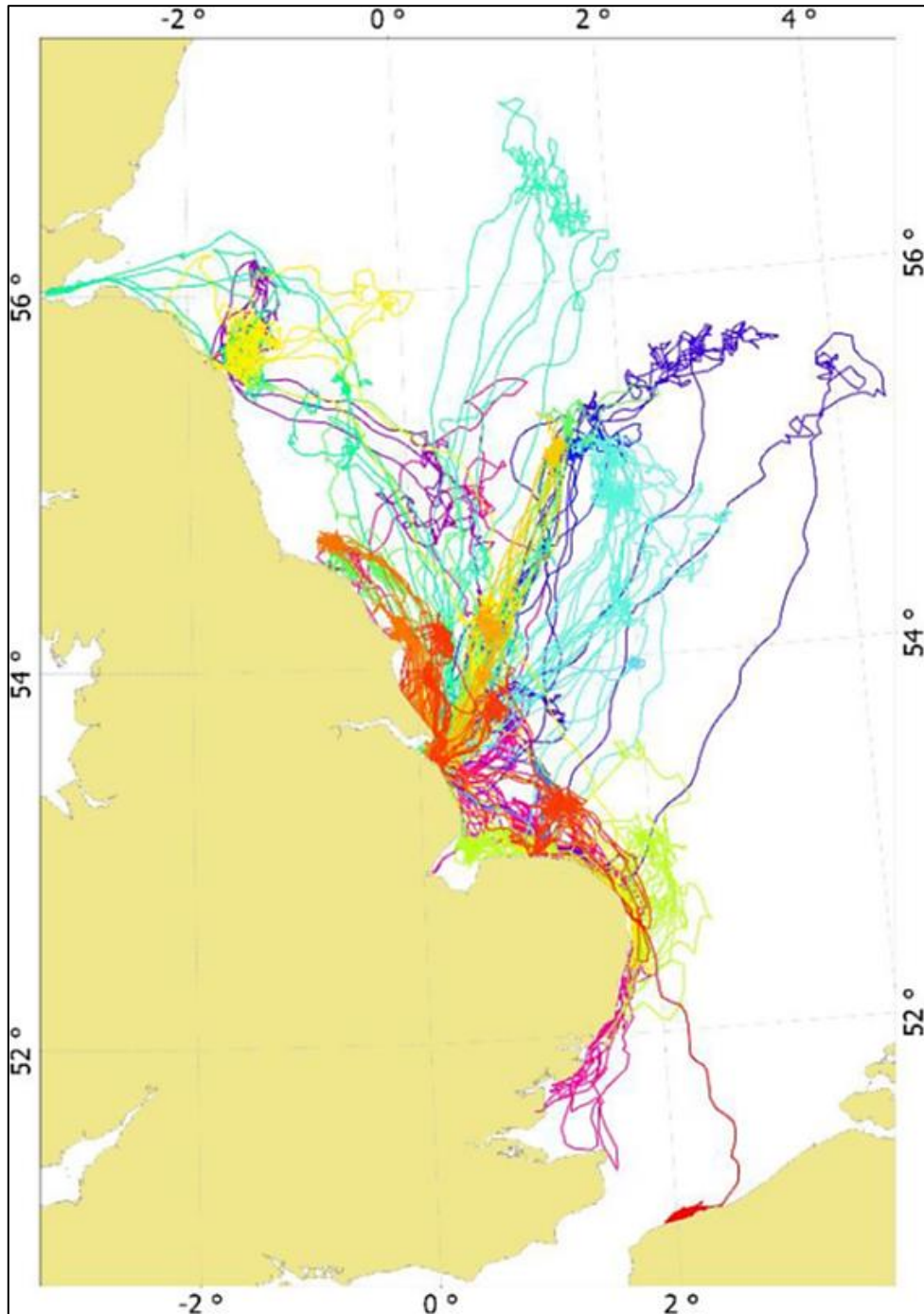


Plate 7.3 Tagged grey seal movements along the East coast of England (Russell, 2016)

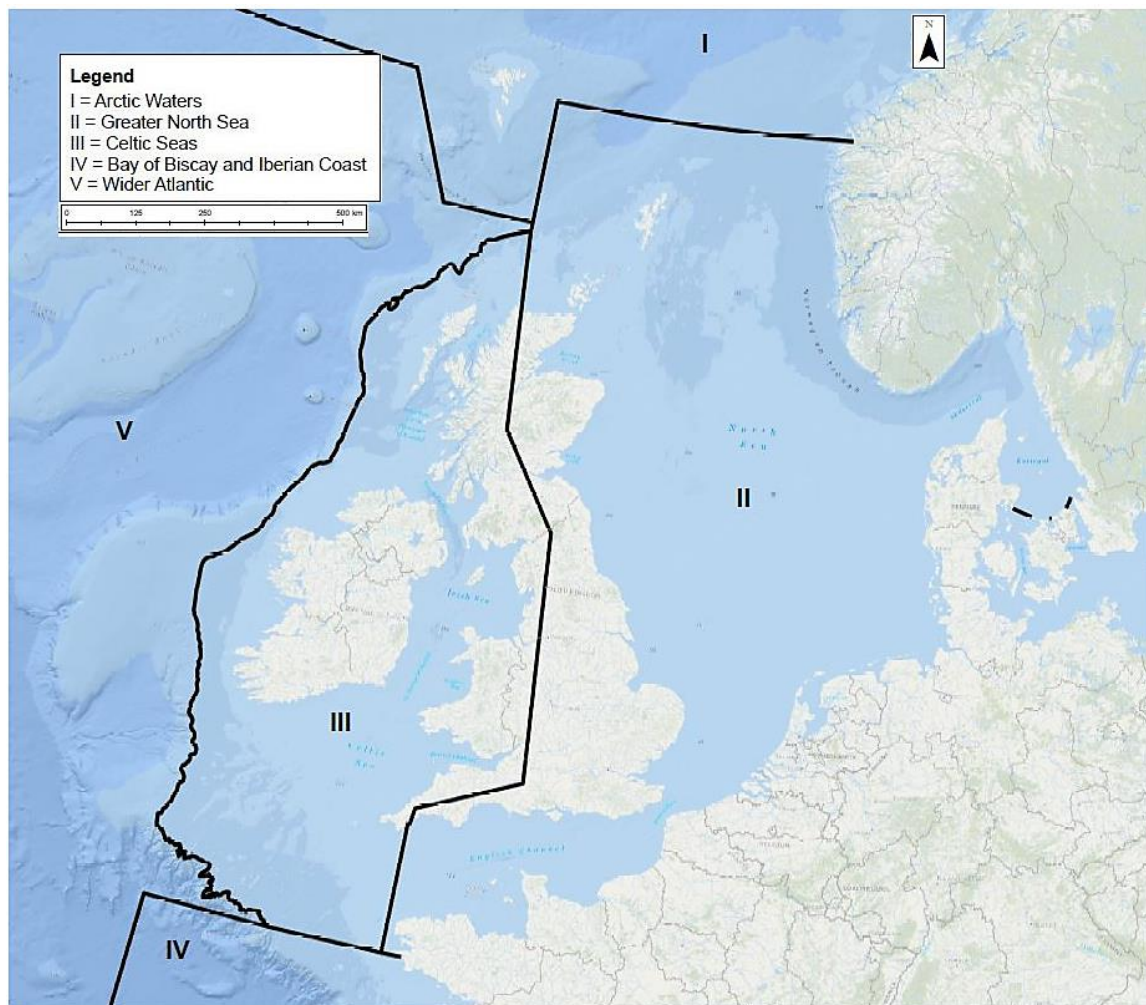


Plate 7.4 Greater North Sea OSPAR region

7.1.4.2.1 Underwater Noise

185. Studies on the interactions between seals and offshore windfarms, have shown avoidance of pile driving activity out to ranges of 25km, but did not show avoidance of general construction activity or of operational windfarms (Russell *et al.*, 2016; SCOS, 2016). Therefore, with regard to direct underwater noise effects on designated sites or individual grey seals within them, all designated sites for grey seal are screened out as they are all located more than 25km from the East Anglia ONE North windfarm site (**Table 7.2**).

186. As outlined above, grey seals could come from any of the designated sites considered to have potential connectivity and as a result these may be affected within the potential disturbance range of 25km range.

187. However, it will be assumed, as a worst-case scenario, that at any one time, grey seal in the area of the proposed East Anglia ONE North project are associated with the nearest designated site (as they cannot simultaneously be part of the population

of multiple designated sites, although all are part of the larger North Sea population). Therefore, connectivity of grey seals from all designated sites, other than the Humber Estuary SAC which is 173km at its closest point, is screened out with regard to the potential effects of underwater noise at the East Anglia ONE North windfarm site (*Table 7.3*).

188. Applying the same approach, the in-combination assessment will also only consider the Humber Estuary SAC.

7.1.4.2.2 Vessel Interactions

189. As outlined in **section 7.1.4.1.2**, concentrated vessel activity will occur in the vicinity of the East Anglia ONE North windfarm site (beyond this, vessel activity will be dispersed and becomes part of the background vessel traffic).
190. The offshore development area has an area of approximately 437km², based on the estimated density of 0.12 grey seal per km² (calculated from the latest SMRU seal-at sea maps; Russell *et al.*, 2017), the number of individuals that could be present within in the offshore development area is up to 53 individuals.
191. There is little information on collision rates or avoidance behaviour in seals, however it should be noted that the majority of vessels within the offshore project area will be slow moving or stationary. It is also highly unlikely that every seal in the offshore project area will be at risk of vessel collision. Taking into account the potential for seals to detect and avoid vessels, e.g. with an illustrative 90- 95% avoidance rate (as worst-case scenario), the number of seals that could be at increased collision risk is between two and five. This is 0.03-0.08% of the current South-east England MU of 6,085 grey seals (SCOS, 2017).
192. At this magnitude of effect it is not considered that there is potential for LSE on any site to which the individual could be attributed as a result of vessels within the offshore development area. Therefore, all designated sites are screened out with regard to vessel interaction within the East Anglia ONE North windfarm site.
193. However, the potential effects of vessel movements out with the offshore development area in the vicinity of any designated sites as they move between the port and the East Anglia ONE North windfarm site will be assessed. The port location is not confirmed at this stage, however if a port to the north (e.g. Hull) is selected there is potential for impact on the Humber Estuary SAC due to the proximity of this site to Hull port. If a port to the south is used (e.g. Great Yarmouth or Lowestoft) there will be no impact on grey seal SACs due to the distance of this site and the route vessels would be required to take from designated sites.

194. The number of vessel movements between the port and the East Anglia ONE North windfarm site in relation to the existing vessel traffic will be assessed for any potential effects on the Humber Estuary SAC. Therefore, all designated sites, other than the Humber Estuary SAC are screened out with regard to the potential effects of vessel interactions (**Table 7.3**).
195. Applying the same approach, the in-combination assessment will also only consider any potential effects of increased vessel interaction between the port and the East Anglia ONE North windfarm site for the Humber Estuary SAC.

7.1.4.2.3 Disturbance at seal haul-out sites

196. There is no potential for any direct disturbance to haul-out sites as a result of activities within the East Anglia ONE North windfarm site due to the distance between the site and the closest point onshore (36km).
197. There is also no potential for any direct disturbance as a result of activities within the East Anglia ONE North offshore cable corridor due to the distance between the nearest major haul-out site at Winterton-Horsey and the cable landfall at Sizewell, which is located over 60km along the coast.
198. Although grey seal could haul-out at other sites along the coast, the number of seal at these sites is likely to be low; the sites infrequently used and are unlikely to be used by significant numbers of seals during the breeding and moult periods. It is also worth noting that the landfall area has Sizewell A and Sizewell B nuclear power station to the north, the village of Thorpeness to the south as well as small scale fishing and recreational activity, meaning the landfall and adjacent area is likely to be suboptimal as a haul-out location.
199. The response of seals to disturbance at haul-out sites can range from increased alertness to moving into the water (Wilson, 2014). The potential impact on pupping groups can include temporary or permanent pup separation, disruption of suckling, energetic costs and energetic deficit to pups, physiological stress and sometimes enforced move to distant or suboptimal habitat (Wilson, 2014). Potential impacts on moulting groups can include energy loss and stress, while impacts on other haul-out groups can cause loss of resting and digestion time and stress (Wilson, 2014). The potential impacts will be determined by the response of the seals, the duration and proximity of the disturbance to the seals.
200. Studies on the distance of disturbance, on land or in the water, from hauled-out seals have found that the closer the disturbance, the more likely seals are to move into the water. For the grey seal, mothers responded by moving into the water more due to boat speed rather than as a result of the distance, although movement into the water was generally observed to occur at distances of between 20 and 70m, with

no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey seals have also been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014).

201. Vessels moving to and from the offshore windfarm and offshore export cable corridor would not be moving within 500m of the coast. There is therefore no potential for any direct disturbance to hauled out seals as a result of vessel presence. Vessels will use the most direct routes to and from the site and ports and would be located a safe distance from the shore to avoid the risk of collision and grounding.

202. The construction port is not yet known and could be located on the south east coast of England. Vessel movements to and from any port will be incorporated within existing vessel routes. However, taking into account the proximity of shipping channels to and from existing ports, it is likely that seals hauled-out along these routes and in the area of the ports would be habituated to the noise, movements and presence of vessels.

203. The potential for disturbance at seal haul-out sites as a result of vessels is highly unlikely and has been screened out from further assessment in the HRA. As this is screened out for the project-alone effects, it is also screened out from the in-combination assessment.

7.1.4.2.4 Changes to water quality

204. Disturbance of seabed sediments has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. The accidental release of contaminants (e.g. through spillage) also has the potential to effect water quality. There is the potential for increased suspended sediments. Any potential changes to water quality in the East Anglia ONE North windfarm site will be considered further in the HRA.

205. As outlined above, it is considered, as a worst-case, that all grey seal in the area of the offshore development area are associated with the nearest Designated site, the Humber Estuary SAC and therefore all Designated sites, with the exception of the Humber Estuary SAC, are screened out with regard to any potential changes to water quality within the East Anglia ONE North windfarm site (**Table 7.3**).

7.1.4.2.5 Changes to Prey Resources

206. Preliminary site specific underwater modelling results (ITAP, 2018 unpublished) indicates that noise impacts upon fish will be limited to a range of less than 40km. Therefore, given that all designated sites for grey seal are located at a distance of 50km or greater from the East Anglia ONE North windfarm site direct effects on all sites are screened out (**Table 7.3**).

207. As outlined above, it is considered, as a worst-case, that all grey seal in the area of the offshore development area are associated with the nearest designated site, the Humber Estuary SAC and therefore all designated sites, with the exception of the Humber Estuary SAC, are screened out with regard to any potential effects of changes to prey resources within the East Anglia ONE North windfarm site itself (*Table 7.3*).

208. Applying the same approach, the in-combination assessment will also only consider the Humber Estuary SAC.

7.1.4.3 Harbour Seal

209. For harbour seal, the screening process considers designated sites where the species is a grade A, B or C feature and there is the potential for connectivity between harbour seals from the designated site and the offshore development area (i.e. demonstration of a clear source-pathway-receptor relationship).

210. SMRU, in collaboration with others, has deployed around 344 telemetry tags on harbour seals around the UK between 2001 and 2012 (**Plate 7.5**; Russell and McConnell, 2014). The spatial distributions indicate harbour seals persist in discrete regional populations, display heterogeneous usage, and generally stay within 50km of the coast (Russell and McConnell, 2014).

211. Harbour seals generally make smaller foraging trips than grey seal, typically travelling 40-50km from their haul-out sites to foraging areas (SCOS, 2017). Tracking studies have shown that harbour seals travel 50-100km offshore and can travel 200km between haul-out sites (Lowry *et al.*, 2001; Sharples *et al.*, 2012). The range of these trips varies depending on the location and surrounding marine habitat. Tagging studies undertaken on harbour seal at The Wash (2003-2005) have shown that this population travels larger distances for their foraging trips than for other harbour seal populations and repeatedly forage between 75km and 120km offshore (average was 80km), with one seal travelling 220km (Sharples *et al.*, 2012). Telemetry studies indicate that the tracks of tagged harbour seals have a more coastal distribution than grey seals and do not travel as far from haul-outs (Russell and McConnell, 2014).

212. To take the wide range and movements of harbour seal into account, all designated sites in the Greater North Sea OSPAR region **Plate 7.3** were considered. All designated sites out with this region were screened out from further consideration.

213. **Table 7.3** shows a list of designated sites considered to have potential connectivity to the offshore development area. This list has been further refined and screened, in relation to the potential effects assessed below.

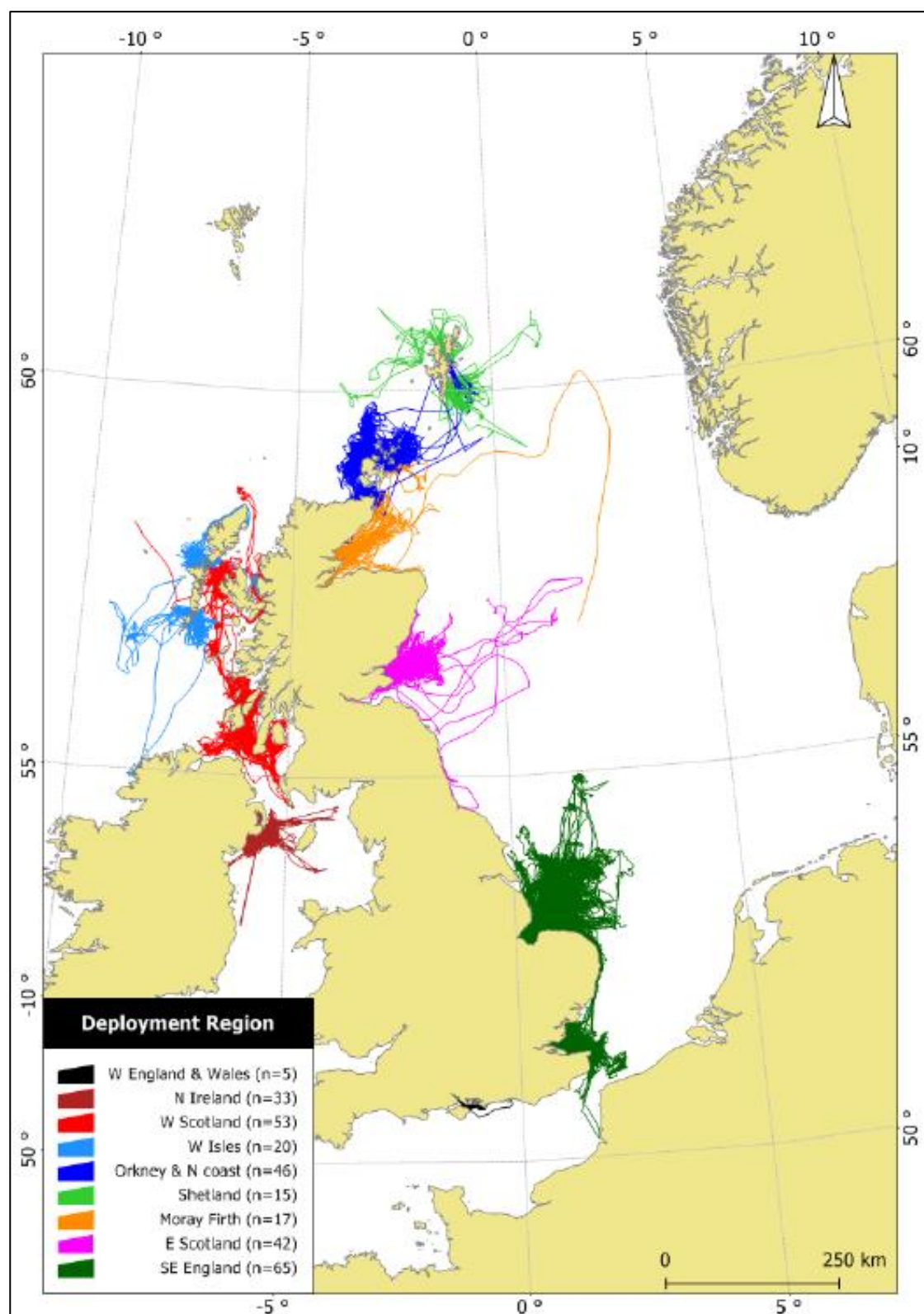


Plate 7.5 Telemetry tracks by deployment region for harbour seals aged one year or over (Russell and McConnell, 2014)

7.1.4.3.1 Underwater Noise

214. Following the same approach as used for grey seal, with regard to direct underwater noise effects on designated sites or individual harbour seals within them, all designated sites for harbour seal are screened out as they are all located more than 25km from the East Anglia ONE North windfarm site (**Table 7.3**).
215. As outlined above, harbour seals could come from any of the designated sites considered to have potential connectivity, given that harbour seal are highly mobile and as a result these may be affected within the potential disturbance range of 25km range.
216. As for grey seal it will be assumed, as a worst-case scenario, that at any one time, harbour seal in the offshore development area are associated with the nearest designated site. Therefore, connectivity of harbour seal from all designated sites, other than the Wash and North Norfolk SAC is screened out with regard to the potential effects of underwater noise at the East Anglia ONE North windfarm site (**Table 7.3**).
217. Applying the same approach, the in-combination assessment will also only consider the Wash and North Norfolk SAC.

7.1.4.3.2 Vessel Interactions

218. As outlined in **section** Vessel Interactions **7.1.4.2.2**, concentrated vessel activity will occur in the vicinity of the offshore development area (beyond this, vessel activity will be dispersed and becomes part of the background vessel traffic).
219. The offshore development area has an area of approximately 437km², based on the estimated density of 0.01 harbour seal per km² (calculated from the latest SMRU seal-at sea maps; Russell *et al.*, 2017), the number of individuals that could be present within in the offshore development area is up to five individuals.
220. Using the same approach as for grey seal (see **section 7.1.4.2.2**) with an illustrative 90-95% avoidance rate (as worst-case scenario), the number of seals that could be at increased collision risk is less than one (0.25-0.5 individuals). This represents 0.005-0.01% of the harbour seal south-east England MU of 5,061 harbour seals (SCOS, 2017).
221. At this magnitude of effect it is considered that there is no potential for LSE on any site to which the individual could be attributed. Therefore, all sites are screened out with regard to vessel interaction at the offshore development area.
222. However, the potential effects of vessel movements out with the offshore development area in the vicinity of any designated sites as they move between the

port and the East Anglia ONE North windfarm site will be assessed. The port location is not confirmed at this stage, however if a port to the north (e.g. Hull) is selected there is potential for impact on the Wash and North Norfolk Coast SAC due to the proximity of this site to Hull port. If a port to the south is used (e.g. Great Yarmouth or Lowestoft) there will be no impact on harbour seal SACs due to the distance of this site and the route vessels would be required to take from designated sites.

223. The number of vessel movements in relation to the existing vessel traffic will be assessed for any potential effects on the Wash and North Norfolk Coast SAC. Therefore, all designated sites, other than the Wash and North Norfolk Coast SAC are screened out with regard to the potential effects of vessel interactions (**Table 7.3**).

224. Applying the same approach, the in-combination assessment will also only consider any potential effects of increased vessel interaction between the port and the East Anglia ONE North windfarm site for the Wash and North Norfolk Coast SAC.

7.1.4.3.3 Disturbance at seal haul-out sites

225. There is no potential for any direct disturbance as a result of activities within the East Anglia ONE North windfarm site due to the distance between the site and the closest point onshore (36km).

226. There is also no potential for any direct disturbance as a result of activities within the East Anglia ONE North offshore cable corridor due to the distance between the nearest major haul-out site at Winterton-Horsey and the cable landfall at Sizewell, which is located over 60km along the coast.

227. As for grey seal (see **section 7.1.4.2.3**) although harbour seal could haul-out at other sites along the coast, these are likely to be a suboptimal haul-out locations with insignificant numbers hauled-out.

228. The responses of harbour seals to disturbance are the same as those discussed for grey seals in **section 7.1.4.2.3**

229. As previously discussed, disturbance to seals from vessel movements have been reported at up to 300m (Wilson, 2014). Vessels moving to and from the offshore development area would not be moving less than 500m from the coast and there is, therefore, no potential for any direct disturbance to hauled-out seals as a result of vessels being present. Vessels will use the most direct routes to and from the site and ports and would be located a safe distance from the shore to avoid the risk of collision and grounding.

230. As previously discussed, the construction port is not yet known and could be located on the south east coast of England. Vessel movements to and from any port will be incorporated within existing vessel routes and it is likely that seals hauled-out along established vessel routes and near ports would be habituated to the noise, movements and presence of vessels.

231. The likelihood of disturbance at seal haul-out sites as a result of vessels is highly unlikely and has been screened out from further assessment in the HRA.

7.1.4.3.4 Changes to water quality

232. Disturbance of seabed sediments has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. The accidental release of contaminants (e.g. through spillage) also has the potential to effect water quality. There is the potential for increased suspended sediments. Any potential changes to water quality in the East Anglia ONE North windfarm site will be considered further in the HRA.

233. As outlined above, it is considered, as a worst-case, that all harbour seal in the area of the proposed East Anglia ONE North project are associated with the nearest Designated site, the Wash and North Norfolk Coast SAC and therefore all Designated sites, with the exception of the Wash and North Norfolk Coast SAC, are screened out with regard to any potential changes to water quality (**Table 7.3**).

7.1.4.3.5 Changes to Prey Resources

234. Preliminary site specific underwater modelling results (ITAP, 2018 unpublished) indicate that noise impacts upon fish will be limited to a range of less than 40km. Given that all designated sites for harbour seal are located at a distance of 50km or greater from the East Anglia ONE North windfarm site; direct effects on all sites are screened out.

235. As outlined above, it is considered, as a worst-case, that all harbour seal in the area of the proposed East Anglia ONE North project are associated with the nearest designated site, the Wash and North Norfolk Coast SAC and therefore all designated sites, with the exception of the Wash and North Norfolk Coast SAC, are screened out with regard to any potential effects of changes to prey resources (**Table 7.3**).

7.1.5 Summary of Potential Impacts to be Considered

236. To summarise, the following species are considered within the HRA screening assessment:

- Harbour porpoise;
- Grey seal; and

- Harbours seal.

237. The following potential effects during construction, operation, maintenance and decommissioning are considered in the HRA screening process:

- Underwater noise, including UXO clearance, piling and other construction activities, vessels, operation and maintenance activities, operational turbines and decommissioning activities;
- Vessel interactions (increased collision risk);
- Changes to water quality;
- Changes to prey resources; and
- Any in-combination effects of (i) underwater noise; (ii) vessel interactions; (iii) any changes to water quality; and (iv) changes to prey resources.

7.2 Screening

7.2.1 Site Screening

238. There are three designated sites within the southern North Sea which have Annex II marine mammal species as qualifying features that have been screened in to the HRA (**Table 7.3**)

Table 7.3 List of cSACs SACs, SCIs and SPAs with their Respective Categories of Marine Mammal Interest Feature and Screening Decisions

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
BEMNZ0001	Belgium	Vlaamse Banken SAC	Harbour porpoise Harbour seal Grey seal	86	89	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
BEMNZ0002	Belgium	SBZ 1 / ZPS 1 SPA	Harbour porpoise Grey seal Harbour seal	121	124	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
BEMNZ0003	Belgium	SBZ 2 / ZPS 2 SPA	Harbour porpoise Grey seal Harbour seal	110	115	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
BEMNZ0004	Belgium	SBZ 3 / ZPS 3 SPA	Harbour porpoise Grey Seal Harbour seal	110	120	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
BEMNZ0005	Belgium	Vlakte van de Raan SCI	Harbour porpoise Grey seal Harbour seal	108	117	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DK00EY133	Denmark	Agger Tange, Nissum Bredning, Skibsted Fjord Og Agerø	Harbour seal	603	613	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00FX122	Denmark	Ålborg Bugt, Randers Fjord Og Mariager Fjord	Harbour seal	847	867	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00DX146	Denmark	Anholt Og Havet Nord For	Harbour seal Grey seal	907	923	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00EX026	Denmark	Dråby Vig	Harbour seal	663	678	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA259	Denmark	Gule Rev SCI	Harbour porpoise	636	652	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00FX257	Denmark	Havet Omkring Nordre Rønner	Harbour seal Grey seal	837	853	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DK003X202	Denmark	Hesselø Med Omliggende Stenrev	Harbour seal Grey seal	983	997	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00FX113	Denmark	Hirsholmene, Havet Vest Herfor Og Ellinge Å's Udløb	Harbour seal Grey seal	814	823	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA302	Denmark	Knudegrund SAC	Harbour porpoise	746	759	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00EY124	Denmark	Løgstør Bredning, Vejlerne Og Bulbjerg	Harbour seal	673	693	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA301	Denmark	Lønstrup Rødgrund SAC	Harbour porpoise	728	746	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00EY134	Denmark	Lovns Bredning, Hjarbæk Fjord Og Skals, Simsted Og Nørre Ådal, Samt Skravad Bæk	Harbour seal	699	716	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DK00FX123	Denmark	Nibe Bredning, Halkær Ådal Og Sønderup Ådal	Harbour seal	705	723	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA340	Denmark	Sandbanker ud for Thyboron SAC	Harbour porpoise	589	605	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA341	Denmark	Sandbanker ud for Thorsminde SAC	Harbour porpoise	557	574	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00FX112	Denmark	Skagens Gren og Skagerrak SAC	Harbour porpoise	754	771	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00FX010	Denmark	Strandenge På Læsø Og Havet Syd Herfor	Harbour seal Grey seal	850	870	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA258	Denmark	Store Rev SCI	Harbour porpoise	720	737	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DK00VA347	Denmark	Sydlig Nordsø SAC	Harbour porpoise Grey seal Harbour seal	431	448	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00VA348	Denmark	Thyboron Stenvolde SCI	Harbour porpoise	572	588	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00AY176	Denmark	Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde SAC	Harbour porpoise Grey seal Harbour seal	477	495	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DK00CY040	Denmark	Venø, Venø Sund	Harbour seal	633	649	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR5300017	France	Abers - Côtes Des Legendes SAC	Grey seal	645	619	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
FR5300023	France	Archipel Des Glenan SAC	Grey seal	768	796	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR3102005	France	Baie de Canche et couloir des trois estuaires SAC	Harbour porpoise Grey seal Harbour seal	199	177	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR5300015	France	Baie De Morlaix SAC	Grey seal	595	568	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR2502020	France	Baie de Seine occidentale SAC	Harbour porpoise Harbour seal	386	354	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR2502021	France	Baie de Seine orientale SAC	Harbour porpoise Harbour seal	361	332	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
FR2500077	France	Baie Du Mont Saint-Michel	Harbour seal Grey seal	541	502	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR3102002	France	Bancs des Flandres SAC	Harbour porpoise Grey seal Harbour seal	110	100	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR5300020	France	Cap Sizun SAC	Grey seal	723	694	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR2500079	France	Chausey SAC	Grey seal	510	479	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR5302007	France	Chaussée de Sein	Grey seal	743	715	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
FR5300009	France	Cote De Granit Rose-Sept-Iles SAC	Grey seal	557	528	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR3100474	France	Dunes De La Plaine Maritime Flamande SAC	Harbour seal	134	129	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR3100480	France	Estuaire De La Canche, Dunes Picardes Plaquees Sur L'ancienne Falaise, Foret D'hardelot Et Falaise D'equihen SAC	Harbour seal	187	166	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR2300121	France	Estuaire de la Seine SCI	Harbour porpoise Harbour seal	356	330	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR2200346	France	Estuaires et littoral picards (baies de Somme et d'Authie) SAC	Harbour porpoise Harbour seal	221	199	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
FR3100478	France	Falaises du Cran aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant SAC	Harbour porpoise Grey seal Harbour seal	162	142	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects. The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE. No potential connectivity.
FR2300139	France	Littoral Cauchois SAC	Harbour porpoise	259	238	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR5300018	France	Ouessant-Molene SAC	Grey seal	675	648	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR2500088	France	Marais du Cotentin et du Bessin - Baie Des Veys	Harbour seal	407	378	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR7200811	France	Panache De La Gironde Et Plateau Rocheux De Cordouan (Système	Grey seal	1,080	1,050	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
		Pertuis Gironde) SAC					
FR5400469	France	Pertuis Charentais SAC	Grey seal	1,002	974	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR5300019	France	Presqu'île De Crozon SAC	Grey seal	704	677	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
FR2500085	France	Récifs et Marais Arrière-Littoraux du Cap Lévi À la Pointe de Saire	Grey seal Harbour seal	385	357	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR3102003	France	Recifs Gris-Nez Blanc-Nez SAC	Harbour porpoise Grey seal Harbour seal	153	132	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
FR3102004	France	Ridens et dunes hydrauliques du détroit du Pas-de-Calais SAC	Harbour porpoise Harbour seal Grey seal	136	134	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
FR5300010	France	Tregor Goëlo SAC	Grey seal	556	529	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
DE2104301	Germany	Borkum-Riffgrund SCI	Grey seal Harbour seal	294	313	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE1003301	Germany	Doggerbank SCI	Harbour seal	346	360	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE1115391	Germany	Dünenlandschaft Süd-Sylt SAC	Grey seal	459	479	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DE2016301	Germany	Hamburgisches Wattenmeer SCI	Grey seal Harbour seal	419	441	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE1813391	Germany	Helgoland mit Helgolander Felssockel SAC	Harbour seal Grey seal	405	424	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE2507301	Germany	Hund und Paapsand SCI	Harbour seal	323	342	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE1315391	Germany	Küsten- und Dünenlandschaften Amrums SAC	Grey seal	456	475	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE2424302	Germany	Mühlenberger Loch / Neßsandsci	Harbour seal	526	546	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DE2306301	Germany	Nationalpark Niedersächsisches Wattenmeer SAC	Grey seal Harbour seal	304	323	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE0916391	Germany	NTP S-H Wattenmeer und angrenzende Küstengebiete SAC	Grey seal Harbour seal	419	439	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE2323392	Germany	Schleswig-Holsteinisches Elbästuar und angrenzende Flächen SAC	Harbour seal	445	464	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE1011401	Germany	SPA Ostliche Deutsche Bucht SPA	Harbour seal	412	431	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE1714391	Germany	Steingrund SAC	Harbour seal Grey seal	411	431	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
DE1209301	Germany	Sylter Außenriff SCI	Harbour seal Grey seal	478	497	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE2018331	Germany	Untereibe SCI	Harbour seal	445	465	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
DE2507331	Germany	Unterems und Aussenems SCI	Harbour seal	320	343	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
NL2008001	Netherlands	Doggersbank SAC	Harbour porpoise Grey seal Harbour seal	216	231	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.
NL2008002	Netherlands	Klaverbank SAC	Harbour porpoise Grey seal Harbour seal	158	170	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
NL9802001	Netherlands	Noordzeekustzone SAC	Harbour porpoise Grey seal Harbour seal	140	159	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.
NL3009016	Netherlands	Oosterschelde SAC	Harbour seal	109	123	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
NL2008003	Netherlands	Vlakte van de Raan SAC	Harbour porpoise Grey seal Harbour seal	103	109	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
NL4000017	Netherlands	Voordelta SAC and SPA	Grey seal Harbour seal	93	107	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
NL1000001	Netherlands	Waddenzee SAC	Grey seal Harbour seal	157	176	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
NL9802026	Netherlands	Westerschelde & Saeftinghe	Harbour seal	108	120	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
SE0510050	Sweden	Balgö	Harbour seal	903	920	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520171	Sweden	Gullmarsfjorden	Harbour seal	855	872	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520170	Sweden	Kosterfjorden-Väderöfjorden SAC	Harbour porpoise Harbour seal	867	883	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0510058	Sweden	Kungsbackafjorden	Harbour seal	881	897	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0510084	Sweden	Nidingen	Harbour seal	886	902	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
SE0520057	Sweden	Malmöfjord	Harbour seal	859	875	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520058	Sweden	Måseskär	Harbour seal	847	863	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520043	Sweden	Nordre Älvs Estuarium	Harbour seal	851	867	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0420360	Sweden	Nordvästra Skånes havsområde	Harbour seal Grey seal	955	972	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520176	Sweden	Pater Noster-Skärgården	Harbour seal	846	863	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520036	Sweden	Sälöfjorden	Harbour seal	850	866	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
SE0520188	Sweden	Soteskär	Harbour seal	863	880	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
SE0520001	Sweden	Vrångöskärgården	Harbour seal	863	879	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
UK0017072	UK	Berwickshire and North Northumberland Coast SAC	Grey seal	414	409	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result are negligible and would result in no potential for LSE.
UK0019806	UK	Dornoch Firth and Morrich More	Harbour seal	760	761	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
UK0017096	UK	Faray and Holm of Faray SAC	Grey seal	819	820	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.
UK0030311	UK	Firth of Tay & Eden Estuary	Harbour seal	555	551	Out	The distance between the potential impact range of the proposed project and the site is beyond that of potential for direct or indirect effects.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK0030170	UK	Humber Estuary SAC	Grey seal	179	173	In	Nearest SAC for grey seal to East Anglia ONE North. Assumed that all grey seal in the East Anglia ONE North area are associated with this SAC.
UK0030172	UK	Isle of May SAC	Grey seal	524	519	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.
UK9002361	UK	Mousa	Harbour seal	872	876	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.
UK0030069	UK	Sanday	Harbour seal	814	819	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.
UK0012687	UK	Yell Sound Coast	Harbour seal	911	915	Out	The distance between the potential impact range of the proposed project and the extent of any impact on individuals from this site result in no potential for LSE.
	UK	Southern North Sea cSAC	Harbour porpoise	0.00	0.00	In	East Anglia ONE North is within the cSAC. Assumed that all harbour porpoise in East Anglia ONE North area are associated with this cSAC.

Site code	Country	SAC/SPA name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK0017075	UK	The Wash and North Norfolk Coast SAC	Harbour seal	105	97	In	Nearest SAC for harbour seal to East Anglia ONE North. Assumed that all harbour seal in East Anglia ONE North area are associated with this SAC.

** Distance measured from the closest point of East Anglia ONE North to the closest point of the designated site rounded to the nearest kilometre.*

Please note that only sites listed as having a population of species of grade A, B or C within the Natura 2000 Assessment From have been included within this screening table.

7.2.2 Marine Mammal Screening Summary

239. **Table 7.4** provides a summary of the sites screened in for further consideration in the HRA.

Table 7.4 Designated sites (where Marine Mammals are a Qualifying Feature) Screened into the HRA for Further Assessment

Site	Species/Feature	Reason for screening decision
Southern North Sea cSAC	Harbour porpoise	East Anglia ONE North is within the cSAC. Assume that all harbour porpoise in the East Anglia ONE North area are associated with this cSAC.
Humber Estuary SAC [UK0030170]	Grey seal	Nearest SAC for grey seal to East Anglia ONE North. Assume, as worst-case scenario, that all grey seal in the East Anglia ONE North area are associated with this SAC.
The Wash and North Norfolk Coast SAC [UK0017075]	Harbour seal	Nearest SAC for harbour seal to East Anglia ONE North. Assume, as worst-case scenario, that all harbour seal in the East Anglia ONE North area are associated with this SAC.

8 Offshore Ornithology

8.1 Approach to Screening

8.1.1 Site Selection Criteria (Receptor)

240. Direct or indirect impacts to seabirds may arise from permanent or temporary physical presence or activities relating to the construction, operation or decommissioning of the windfarm and associated infrastructure. Potential impacts include direct impacts from the presence of wind turbines and indirect impacts through effects on prey species.

241. For offshore ornithology, the approach to HRA screening primarily focuses on the potential for connectivity between seabirds from designated populations and the proposed East Anglia ONE North project.

242. This HRA screening exercise therefore considers sites which meet the following criteria:

- A component of the proposed project directly overlaps a site whose interest features includes a species of bird (applies to SPAs and Ramsar sites);
- The distance between the proposed project and a site with a bird interest feature is within the range for which there could be an interaction i.e. the pathway is not too long (applies to SPAs and Ramsar sites). For seabirds in the breeding season this element of the screening process will be informed by published information on maximum foraging range (Thaxter et al., 2012);
- Assessment of species-specific risk which informs the extent to which populations of particular species may be vulnerable to collision mortality, displacement or barrier effects (Garthe & Hüppop 2004, Cook et al. 2012, Furness et al. 2013, Bradbury et al. 2014);
- The distance between the proposed project and resources on which the interest feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be an interaction i.e. the pathway is not too long (applies to SPAs and Ramsar sites); and
- Evidence that a migratory route passes through the proposed project wind turbine array for bird species migrating to and / or from protected sites (applies to SPAs and Ramsar sites). This will be informed by published information on migration routes, principally Wright et al. (2012).

8.1.2 Potential Effects (Source)

243. The key factors that will be applied during the HRA screening process are:

- Potential effects (source); and

- Proximity of source to feature (distance between the proposed development and SPAs, migration routes) (pathway and receptor).

244. During construction of the proposed East Anglia ONE North project, potential disturbance may occur due to the presence of vessels offshore and the installation of offshore infrastructure. Indirect impacts on prey species may also arise.

245. During operation, potential disturbance and displacement may occur due to the presence of vessels and offshore infrastructure. There is potential for collision risk or barrier effects due to the presence of turbines. Indirect impacts on prey species may also arise.

246. Decommissioning would require the removal of foundation structures and either the cutting or removal of subsea cables resulting in disturbance and displacement. Indirect impacts on prey species may also arise.

247. The potential effects on seabirds from the proposed East Anglia ONE North project have been identified within the East Anglia ONE North Scoping Report (SPR, 2017a) and Scoping Opinion (The Planning Inspectorate, 2017). These are provided in **Table 8.1**.

Table 8.1 Summary of Potential Effects – Ornithology Ecology (scoped in (✓) and scoped out (x))

Potential Effects	Construction	Operation	Decommissioning
Direct disturbance and displacement due to work activity and vessel movements	✓	✓	✓
Direct disturbance and displacement due to the presence of turbines, other infrastructure and work vessels.	✓	✓	✓
Collision risk due to the presence of turbines.	x	✓	x
Barrier effects due to the presence of turbines.	x	✓	x
Indirect impacts through effects on habitats and prey species within the windfarm site.	✓	✓	✓
Indirect impacts through effects on habitats and prey species within the offshore cable corridor.	✓	✓	✓
Disturbance due to lighting ¹⁰	✓	x	x

¹⁰ Lighting impacts were agreed to be screened out of the assessment during Evidence Plan discussions (6th March 2018) and further information provided to NE and RSPB and are not considered further for HRA.

Potential Effects	Construction	Operation	Decommissioning
Cumulative (in-combination) disturbance and displacement due to the presence of turbines, other infrastructure and work vessels.	✓	✓	✓
Cumulative (in-combination) collision risk due to the presence of turbines.	x	✓	x
Cumulative (in-combination) barrier effects due to the presence of turbines.	x	✓	x
Transboundary impacts¹¹	x	x	x

8.1.3 Identification of sites and features (Pathway)

248. Based on data collected from site specific surveys for the proposed East Anglia ONE North project and a review of existing data sources, the bird species likely to occur in the East Anglia ONE North windfarm site can be grouped into a series of categories. This categorisation is based on biological relationships related to breeding biology, feeding, habitat use and migratory pathways. The categories are:

- Breeding seabirds;
- Breeding waterbirds;
- Non-breeding seabirds;
- Passage waterbirds;
- Wintering waterbirds.

249. From an initial consideration of all SPAs in the UK and in neighbouring Member States, those SPAs for which there is either no connectivity with the East Anglia ONE North windfarm site, or it has been assessed as negligible, have been screened out. This applies to most SPAs that are distant from the proposed project. However, some bird species are highly mobile and may interact with the proposed East Anglia ONE North project because they range over considerable distances. This mainly applies to seabirds, but can also include terrestrial species which may pass through the site on migration.

250. Bird species that are SPA features, such as shorebirds, may migrate from mainland Europe to eastern England (for example from SPAs in Netherlands to the Wash or Thames estuaries) so these birds need to be considered. Migrating shorebirds and other coastal birds tend to initiate migration under favourable weather

¹¹ Scoping out of transboundary impacts has been provisionally agreed through Evidence Plan discussions (6th of March, 2018) on the understanding that SNH agree that Scottish designated sites are considered as part of the UK baseline and the term transboundary relates to non-UK designated sites. SNH have been contacted for comment.

conditions which allow them to fly at altitudes above collision risk heights. Consequently, these species have rarely been recorded in collision studies at coastal and offshore wind farms (Hüppop *et al.* 2006). Indeed, Hüppop *et al.* (2006) reported that only six out of 442 collision carcasses in their study were non-passerine birds. Assessments of collision risk for migrating shorebirds at offshore wind farms in UK waters has also indicated that the risk is low and for most species does not represent a hazard that would require HRA assessment (Wright *et al.* 2012; WWT 2013).

251. The Netherlands Ministry of Infrastructure and the Environment stated in a letter of 7 July 2014 that they had a concern that the proposed projects in the former East Anglia zone could have an effect on the seabirds of Bruine Bank pSPA. The non-breeding seabirds that are the interest feature of the Bruine Bank (Brown Ridge) pSPA are primarily auks. An assessment of potential impacts on auks was conducted as part of the East Anglia THREE EIA (SPR, 2015) in relation to construction and operational disturbance and displacement. In all cases, impacts were found to be minor or negligible, based on Biologically Defined Minimum Population Scale (BDMPS) populations in UK North Sea waters (Furness, 2015). Assessment of impacts over the whole North Sea (i.e. including non-UK waters) would greatly increase the estimated seabird population sizes and only slightly increase cumulative impacts (as most offshore wind farms are in UK waters). Accordingly, a likely significant effect on the Bruine Bank (Brown Ridge) pSPA can be screened out.
252. The Netherlands Ministry of Infrastructure and Water Management (Rijkswaterstaat) also stated in their letter of 7 July 2014 that 'onshore bird colonies in the Netherlands are all situated more than 100km from the Dutch-UK border, so no effects are to be expected there'. We agree with that interpretation (with one exception discussed below), particularly since seabirds that breed in the Netherlands are predominantly species with coastal and relatively short foraging ranges, such as terns, cormorants and gulls, and there is no evidence that breeding birds from those populations cross into the UK while they are breeding.
253. However, lesser black-backed gulls breed in large numbers in The Netherlands. Between 32,000 and 57,000 pairs were estimated to breed in The Netherlands in 1992-97 (Mitchell *et al.* 2004) and the numbers subsequently increased to a peak of over 90,000 pairs in 2005 (Camphuysen, 2013). With a mean maximum foraging range of 141km from breeding colonies (Thaxter *et al.* 2012a), there is theoretical potential for connectivity between some colonies in The Netherlands and the offshore development area. However, extensive colour ringing and tracking of breeding lesser black-backed gulls from multiple colonies in The Netherlands has found no evidence for connectivity during the breeding season between birds breeding in those colonies and the UK, and also that there is remarkably little migration of birds from the colonies in The Netherlands through UK waters outside

the breeding season (Camphuysen, 2013). Not only do breeding adult lesser black-backed gulls from colonies in The Netherlands normally remain on the continental side of the North Sea while breeding, but 95% of their foraging trips are less than 135km from those colonies (Camphuysen 1995, 2013), so would be very unlikely to reach the offshore development area. These studies therefore rule out any transboundary impacts of the proposed East Anglia ONE North project on any of these breeding lesser black-backed gull populations. It should be noted that the Rijkswaterstaat agreed with the conclusions of the East Anglia THREE HRA screening as stated in the Statement of Common Ground (SPR, 2016a).

254. Similarly, impacts on seabird breeding populations in Germany, Belgium and France can be screened out due to the distance of colonies in those countries from the proposed East Anglia ONE North project, which, with two exceptions discussed below, are more than twice the maximum foraging range of the relevant species (Thaxter *et al.* 2012a).

255. There are two gannet breeding colonies for which the East Anglia ONE North windfarm site lies within the species' reported maximum foraging range (590km, Thaxter *et al.* 2012a); Seevogelschutzgebiet Helgoland SPA (Germany) and Littoral Seine-Marine SPA (France). However, neither of these is within the species' mean maximum range (229km) and tracking studies of breeding adults at each of these colonies have shown that birds from those colonies forage relatively close to their breeding colonies and are therefore very unlikely to travel as far as the East Anglia ONE North windfarm site (Stefan Garthe, *pers. comm.*, Wakefield *et al.* 2013).

256. Following the above considerations, no trans-boundary issues have been screened in for further assessment.

257. Many protected sites in the UK can also be screened out as having negligible or no connectivity with the East Anglia ONE North windfarm site due to their distance from the windfarm site. Due to the proximity of the East Anglia TWO windfarm site to the consented East Anglia ONE and East Anglia THREE sites it has been assumed that SPAs screened from those assessments can be screened out for proposed East Anglia TWO project (DECC, 2013, BEIS, 2017). Screening of sites undertaken for East Anglia ONE North windfarm site has concluded that four sites have been screened in for further detailed assessment: Alde-Ore Estuary SPA, Flamborough & Filey pSPA, Greater Wash SPA and Outer Thames Estuary pSPA.

258. The Alde-Ore Estuary SPA is a minimum of 54km from the East Anglia ONE North windfarm site. Thaxter *et al.* (2012a) report that lesser black-backed gull have a maximum foraging range of 181km, a mean maximum of 141km and a mean of 71.9km. Therefore, since the East Anglia ONE North windfarm site is within the mean range of this species some breeding birds from the Alde-Ore Estuary SPA may

forage there. Further consideration will also be given to specific evidence regarding the foraging of lesser black-backed gulls from the Alde-Ore Estuary SPA, especially in relation to tracking work (Thaxter *et al.* 2012b, 2015), and the extent to which connectivity with the East Anglia ONE North windfarm site may occur.

259. Thaxter *et al.* (2012a) report that herring gull have a maximum foraging range of 92km, a mean maximum of 61.1km and a mean of 10.5km. Therefore, since the East Anglia ONE North windfarm site is within the mean maximum range of this species some breeding birds from the Alde-Ore Estuary SPA may forage there.
260. The Flamborough and Filey Coast pSPA is a minimum of 246km from the East Anglia ONE North windfarm site. Thaxter *et al.* (2012a) report that gannet have a maximum foraging range of 590km and a mean maximum of 229km, puffins have a maximum range of as 200km and a mean maximum of 105km, guillemots have a maximum of 135km and a mean maximum of 84km, kittiwakes have a maximum of 120km and a mean maximum of 60km, and razorbills have a maximum of 95km and a mean maximum of 48km.
261. While RSPB tracking studies of gannets breeding at Flamborough and Filey Coast pSPA suggest low connectivity with the East Anglia ONE North windfarm site (RSPB 2012), the proposed development is within the maximum foraging range (590km) of this species. In addition, some individuals from that colony are likely to pass through the East Anglia ONE North windfarm site during migrations. Consequently, connectivity and the potential for an LSE cannot be ruled out.
262. While the East Anglia ONE North windfarm site is beyond the maximum reported foraging range for kittiwake breeding at Flamborough and Filey Coast pSPA (120km), this population has been found to undertake longer trips than previously thought, with trips extending far out into the Dogger Bank area to forage while breeding (Carroll *et al.* (2017). In addition, some individuals from that colony are likely to pass through the East Anglia ONE North windfarm site during migrations. Consequently, connectivity and the potential for an LSE cannot be ruled out.
263. The East Anglia ONE North windfarm site is beyond the maximum foraging ranges of puffin (200km), guillemot (135km) and razorbill (95km; Thaxter *et al.* 2012a) which breed at Flamborough and Filey Coast pSPA. However, as this is the nearest notable breeding colony for these species it is possible that some individuals from these populations pass through the East Anglia ONE North windfarm site or overwinter in the region of this project. Consequently, there may be some connectivity and the potential for an LSE, although small, cannot be ruled out.
264. Assessed impacts on these populations need to also consider the conservation status of the designated populations e.g. increases in gannet numbers (Trinder 2012, WWT 2012, Murray *et al.* 2015) but declines in kittiwake and many other seabird

breeding numbers. In addition there is a need to consider other factors driving population change, such as breeding success (Coulson 2017), the influences on this of changes in fish stocks and fisheries (ICES 2013, Carroll *et al.* 2017), and winter distributions of birds (Frederiksen *et al.* 2012).

265. The Greater Wash SPA is approximately 39km from the East Anglia ONE North windfarm site at its closest point (note that this is from the marine extent of the SPA; the East Anglia ONE North windfarm site is approximately **42km** from the closest onshore point of the SPA) Although this is less than the mean maximum foraging range of Sandwich tern, the breeding colonies themselves (already designated as North Norfolk Coast SPA) are beyond foraging range of the East Anglia ONE North windfarm site. This means that there will be little or no breeding season connectivity. Proportions of these populations migrating through the East Anglia ONE North windfarm site are likely to be small as these species are thought to remain close to shore during much of their migration through UK waters. Migrations of non-breeding seabirds (red-throated divers, little gulls and common scoters; Lawson *et al.* 2016) from this pSPA are likely to result in small numbers passing through the site during migration. Given the proximity of the site to this pSPA, further more detailed assessment of the potential for an LSE is therefore appropriate.

266. The Outer Thames Estuary SPA is less than 1km from the East Anglia ONE North windfarm site at its closest (marine) extents and overlaps with the export cable corridor. Although this SPA includes breeding common tern and little tern, on the basis of foraging ranges for these species from their breeding colonies (located at specific sites within the SPA) the potential for connectivity with these species is negligible. The marine component of the SPA is predominantly informed by the distribution of over-wintering red-throated divers. This species is known to be particularly sensitive to disturbance. Therefore, both construction and operation (and potentially decommissioning) of the offshore elements of the proposed development and installation of the offshore export cable corridor (which will traverse the SPA) have the potential to result in LSE and further more detailed assessment is appropriate.

8.2 Screening

8.2.1 Site Screening

267. There are 86 designated sites within the southern North Sea which have Annex II seabird within 950km of the East Anglia ONE North windfarm site which have been considered for the HRA screening (*Table 8.2*). Due to the reasons outlined in section 8.1.3, of these, the following SPAs have been identified for further consideration within the HRA:

- Outer Thames Estuary SPA and pSPA extension;

- Greater Wash SPA;
- Alde-Ore Estuary SPA and Ramsar; and
- Flamborough and Filey Coast pSPA.

268. The remaining sites are not considered to be within a range or have a pathway that has the potential to result in LSE and are therefore proposed to be ruled out of further consideration within the HRA.

269. Results of the HRA screening and justification for scoping out sites is presenting in **Table 8.2** below.

Table 8.2 List of SPA and Ramsar Sites with their Respective Categories of Bird Interest Feature and Screening Decisions

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
BEMNZ0004	Belgium	SBZ 3 / ZPS 3 (off Molenhoek)	Non-breeding seabirds	111	121	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
BEMNZ0003	Belgium	SBZ 2 / ZPS 2 (off Ostend)	Non-breeding seabirds	110	117	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
BEMNZ0002	Belgium	SBZ 1 / ZPS 1 (off Nieuwpoort)	Non-breeding seabirds	121	124	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
FR2310045	France	Littoral Seine-Marine SPA	Breeding seabirds	261	235	Out	East Anglia ONE North is within the theoretical maximum foraging range of breeding gannets from this SPA, but tracking data show that breeding gannets from the SPA do not reach East Anglia ONE North. The SPA is far beyond maximum foraging range of other designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are likely to be extremely small relative to BDMPS.

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
FR2502020	France	Baie de Seine Occidentale SPA	Breeding, wintering and passage waterbirds	380	343	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
FR2510099	France	Falaise du Bessin Occidental SPA	Breeding seabirds	396	360	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
DE2104301	Germany	Borkum-Riffgrund SPA	Non-breeding seabirds	292	311	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
DE1209301	Germany	Sylter Außenriff SPA	Non-breeding seabirds	378	397	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
DE1813491	Germany	Seevogelschutzgebiet Helgoland SPA	Breeding seabirds	405	424	Out	Tracking data from gannets breeding on Helgoland show these birds do not travel in the direction of or as far as East Anglia ONE North despite this site being within theoretical maximum foraging range of gannet. The site is beyond the maximum foraging range of other

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							seabird species at Helgoland. Proportions of these populations migrating through East Anglia ONE North are likely to be very small relative to BDMPS regional populations.
DE1011401	Germany	Östliche Deutsche Bucht SPA	Non-breeding seabirds	411	430	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
DE0916491	Germany	Ramsar-Gebiet S-H Wattenmeer und angrenzende Küstengebiete SPA	Breeding, wintering and passage waterbirds	419	439	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
N/A	Netherlands	Bruinebank (Brown Ridge) pSPA	Non-breeding seabirds	40	58	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
N/A	Netherlands	Friese Front pSPA	Non-breeding seabirds	154	174	Out	Migrations of birds from this SPA are likely to result in negligible numbers passing through East Anglia ONE North during migration relative to the size of BDMPS regional populations.
NL4000017	Netherlands	Voordelta SPA	Wintering and	93	106	Out	Survey data show little or no evidence of SPA features occurring in East Anglia

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
			passage waterbirds				ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
NL9801001	Netherlands	Waddenzee (Wadden Sea) SPA	Wintering and passage waterbirds	157	177	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9020309	UK	Outer Thames Estuary SPA and pSPA extension	Wintering marine birds and breeding terns	0.15	0	In	SPA is beyond maximum foraging range of designated breeding seabird species (terns) and tern foraging tends to be coastal so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are likely to be small as these species are thought to remain close to shore during much of their migration through UK waters. Given the proximity of the site to this pSPA further more detailed assessment is appropriate. Disturbance to red-throated diver is possible, especially during export cable installation.
UK9009101	UK	Minsmere - Walberswick SPA and Ramsar	Breeding, wintering and	44	1.6	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
			passage waterbirds				numbers passing through the site during migration.
UK9009253	UK	Broadland SPA and Ramsar	Wintering and passage waterbirds	22	41	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
N/A	UK	Greater Wash pSPA	Non-breeding seabirds and breeding terns	39	32	IN	SPA is beyond maximum foraging range of designated seabird species (terns) and tern foraging tends to be coastal so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are likely to be small as these species are thought to remain close to shore during much of their migration through UK waters. Migrations of non-breeding seabirds from this pSPA are likely to result in small numbers passing through the site during migration, but given the proximity of the site to this pSPA further more detailed assessment of that is appropriate.
UK9009112	UK	Alde-Ore Estuary SPA and Ramsar	Breeding seabirds and breeding, wintering and	3.2	54	IN	Lesser black-backed gull and herring gull populations may have connectivity with East Anglia ONE North. This SPA holds the closest large colony of these species to East Anglia ONE North, and some

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
			passage waterbirds				birds from that SPA may pass through East Anglia ONE North during migration.
UK9009271	UK	Great Yarmouth and North Denes SPA	Breeding seabirds	33	43	Out	SPA is beyond maximum foraging range of designated seabird species (little tern) and little tern foraging tends to be coastal so has no breeding season connectivity. Proportions of this populations migrating through East Anglia ONE North are likely to be small as the species is thought to remain close to shore during much of its migration through UK waters.
UK9009181	UK	Breydon Water SPA and Ramsar	Wintering and passage waterbirds	34	44	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009261	UK	Deben Estuary SPA and Ramsar	Wintering and passage waterbirds	18	72	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009031	UK	North Norfolk Coast SPA and Ramsar	Wintering and passage waterbirds	93	100	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							numbers passing through the site during migration.
UK9009121	UK	Stour & Orwell Estuaries SPA and Ramsar	Wintering and passage waterbirds	35	87	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9008021	UK	The Wash SPA and Ramsar	Wintering and passage waterbirds	129	104	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009131	UK	Hamford Water SPA and Ramsar	Wintering and passage waterbirds	86	38	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9008022	UK	Gibraltar Point SPA and Ramsar	Wintering and passage waterbirds	151	131	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009243	UK	Colne Estuary SPA and Ramsar	Wintering and	103	56	Out	Survey data show little or no evidence of SPA features occurring in East Anglia

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
			passage waterbirds				ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK0030170	UK	Humber Estuary SPA and Ramsar	Wintering and passage waterbirds	179	173	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009141	UK	Abberton Reservoir SPA and Ramsar	Wintering and passage waterbirds	113	69	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009245	UK	Blackwater Estuary SPA and Ramsar	Wintering and passage waterbirds	114	66	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009242	UK	Dengie SPA and Ramsar	Wintering and passage waterbirds	115	68	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK9009246	UK	Foulness SPA and Ramsar	Wintering and passage waterbirds	113	69	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009244	UK	Crouch & Roach Estuaries SPA and Ramsar	Wintering and passage waterbirds	124	78	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9012071	UK	Thanet Coast and Sandwich Bay SPA and Ramsar	Wintering and passage waterbirds	118	88	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9009171	UK	Benfleet & Southend Marshes SPA and Ramsar	Wintering and passage waterbirds	139	94	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9012011	UK	The Swale SPA	Wintering and passage waterbirds	140	98	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							numbers passing through the site during migration.
UK9012021	UK	Thames Estuary and Marshes SPA and Ramsar	Wintering and passage waterbirds	146	102	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9012031	UK	Medway Estuary & Marshes SPA and Ramsar	Wintering and passage waterbirds	147	102	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9006171	UK	Hornsea Mere SPA	Wintering and passage waterbirds	234	236	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9006101	UK	Flamborough and Filey Coast pSPA	Breeding seabirds	246	239	IN	Potential connectivity due to uncertain roportions of the kittiwake, gannet, common guillemot, razorbill and puffin populations migrating through East Anglia ONE North. Max foraging distances suggest only gannet has potential for connectivity during the breeding season but tracking data

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							indicate no connectivity of breeding gannets.
UK9006061	UK	Teesmouth and Cleveland Coast SPA and Ramsar	Wintering and passage waterbirds	331	322	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9006131	UK	Northumbria Coast SPA and Ramsar	Wintering and passage waterbirds	347	340	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9011011	UK	Chichester & Langstone Harbours SPA	Migratory waterbirds	227	274	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9011051	UK	Portsmouth Harbour SPA	Migratory waterbirds	286	238	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK9011061	UK	Solent & Southampton Water SPA	Migratory waterbirds	294	246	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9006031	UK	Coquet Island SPA	Breeding seabirds	410	407	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9006021	UK	Farne Islands SPA	Breeding seabirds	438	433	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9006011	UK	Lindisfarne SPA and Ramsar	Wintering and passage waterbirds	441	435	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9010091	UK	Chesil Beach & The Fleet SPA	Migratory waterbirds	386	339	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							numbers passing through the site during migration.
UK0030281	UK	St Abbbs Head to Fast Castle SPA	Breeding seabirds	481	475	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9004411	UK	Firth of Forth SPA	Wintering and passage waterbirds	509	501	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9010081	UK	Exe Estuary SPA	Migratory waterbirds	443	397	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9004171	UK	Forth Islands SPA	Breeding seabirds	514	508	Out	Tracking data show breeding gannets from Bass Rock do not commute to East Anglia ONE North although the site is just within maximum foraging range. Except for gannet, SPA is far beyond maximum foraging range of other designated seabird species so has no breeding season connectivity. Proportions of these populations

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							migrating through East Anglia ONE North are small relative to BDMPS.
UK9004451	UK	Imperial Dock Lock, Leith SPA	Breeding seabirds	532	525	Out	SPA is far beyond maximum foraging range of designated seabird species (common tern) so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9004121	UK	Firth of Tay & Eden Estuary SPA	Wintering and passage waterbirds	550	545	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9004031	UK	Montrose Basin SPA	Wintering and passage waterbirds	570	567	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9002271	UK	Fowlsheugh SPA	Breeding seabirds	575	573	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK9002491	UK	Buchan Ness to Collieston Coast SPA	Breeding seabirds	611	609	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002221	UK	Ythan Estuary, Sands of Forvie and Meikle Loch SPA	Wintering and passage waterbirds	611	609	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9002211	UK	Loch of Strathbeg SPA	Wintering and passage waterbirds	638	638	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9002471	UK	Troup, Pennan and Lion's Heads SPA	Breeding seabirds	650	650	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9001625	UK	Moray and Nairn Coast SPA	Wintering and passage waterbirds	669	666	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							numbers passing through the site during migration.
UK9001624	UK	Inner Moray Firth SPA	Wintering and passage waterbirds	701	696	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9001623	UK	Cromarty Firth SPA	Wintering and passage waterbirds	713	706	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9001622	UK	Dornoch Firth and Loch Fleet SPA	Wintering and passage waterbirds	717	713	Out	Survey data show little or no evidence of SPA features occurring in East Anglia ONE North and migrations of birds from this SPA are likely to result in negligible numbers passing through the site during migration.
UK9001182	UK	East Caithness Cliffs SPA	Breeding seabirds	735	732	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9001181	UK	North Caithness Cliffs SPA	Breeding seabirds	761	760	Out	SPA is far beyond maximum foraging range of designated seabird species so

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9001131	UK	Pentland Firth Islands SPA	Breeding seabirds	769	769	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002151	UK	Copinsay SPA	Breeding seabirds	784	785	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002141	UK	Hoy SPA	Breeding seabirds	787	788	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002431	UK	Calf of Eday SPA	Breeding seabirds	818	819	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
UK9002091	UK	Fair Isle SPA	Breeding seabirds	827	830	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002371	UK	Rousay SPA	Breeding seabirds	818	819	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002121	UK	Marwick Head SPA	Breeding seabirds	822	819	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002101	UK	West Westray SPA	Breeding seabirds	829	830	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002111	UK	Papa Westray (North Hill and Holm) SPA	Breeding seabirds	835	836	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							migrating through East Anglia ONE North are small relative to BDMPS.
UK9002511	UK	Sumburgh Head SPA	Breeding seabirds	855	860	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002361	UK	Mousa SPA	Breeding seabirds	868	873	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002081	UK	Noss SPA	Breeding seabirds	881	887	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002061	UK	Foula SPA	Breeding seabirds	901	905	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002051	UK	Papa Stour SPA	Breeding seabirds	910	914	Out	SPA is far beyond maximum foraging range of designated seabird species so

Site code	Country	SPA/ Ramsar site name	Category of interest feature	Distance* (km)		Screening decision	Reason for screening decision
				EA1N	Cable corridor		
							has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002031	UK	Fetlar SPA	Breeding seabirds	922	930	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002041	UK	Ronas Hill - North Roe and Tingon SPA	Breeding seabirds	926	931	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.
UK9002011	UK	Hermaness, Saxa Vord and Valla Field SPA	Breeding seabirds	946	952	Out	SPA is far beyond maximum foraging range of designated seabird species so has no breeding season connectivity. Proportions of these populations migrating through East Anglia ONE North are small relative to BDMPS.

* Distance measured from the closest point of East Anglia ONE North to the closest point of the designated site rounded to the nearest kilometre.

** Estimated distance due to insufficient information.

8.2.2 Ornithology Screening Summary

270. Of the 86 designated sites within 953km of the East Anglia ONE North windfarm site, it is proposed that the four sites within **Table 8.3** will be considered further as part of the HRA.

Table 8.3 Summary of HRA Screening Assessment for Ornithology

Site	Species/Feature	Reason for screening decision
Outer Thames Estuary SPA and pSPA Extension	Wintering marine birds and breeding terns.	East Anglia ONE North offshore cable corridor is within the SPA and pSPA extension.
Greater Wash SPA	Non-breeding seabirds	Proximity to the East Anglia ONE North windfarm site may result in small numbers of migratory non-breeding sea birds passing through the East Anglia ONE North windfarm site. Whilst breeding terns are a feature of the SPA, East Anglia ONE North is beyond the maximum foraging range for breeding terns.
Alde-Ore Estuary SPA and Ramsar	Breeding seabirds and breeding, wintering and passage waterbirds	Lesser black-backed gull and herring gull populations may have connectivity with East Anglia ONE North. This SPA holds the closest large colony of these species to East Anglia ONE North, and some birds from that SPA may pass through East Anglia ONE North during migration.
Flamborough and Filey Coast pSPA	Breeding seabirds	Potential connectivity due to uncertain proportions of the kittiwake, gannet, common guillemot, razorbill and puffin populations migrating through East Anglia ONE North. Max foraging distances suggest only gannet has potential for connectivity during the breeding season but tracking data indicate no connectivity of breeding gannets.

9 Summary

271. The results of the HRA screening exercise proposes screening out of all designated sites for terrestrial ecology receptors based on the proximity of sites being too far from the onshore indicative development area to have the potential to result in LSE.

272. Similarly, the results of the HRA screening exercise proposes screening out of all designated sites for benthic ecology and fish receptors based on the proximity of sites being too far from East Anglia ONE North windfarm site to have the potential to result in LSE

273. Sites proposed to be screened into the draft HRA report are presented in **Table 9.1** below;

Table 9.1 Summary of Designated sites and Interest Features Screened in

Site	Features	Rationale
Onshore Sites		
Sandlings SPA	<ul style="list-style-type: none"> Breeding populations of nightjar and woodlark Woodland and heath 	There is potential for both direct and indirect effects upon both the features of the sites and the supporting habitats
Offshore Sites		
Southern North Sea cSAC	<ul style="list-style-type: none"> Harbour porpoise 	Offshore development area is within the cSAC. Assume that all harbour porpoise in this area are associated with this cSAC.
Humber Estuary SAC	<ul style="list-style-type: none"> Grey seal 	Nearest SAC for grey seal to offshore development area. Assume, as worst-case scenario, that all grey seal in this area are associated with this SAC.
The Wash and North Norfolk Coast SAC	<ul style="list-style-type: none"> Harbour seal (and grey seal) 	Nearest SAC for harbour seal to offshore development area. Assume, as worst-case scenario, that all harbour seal in this area are associated with this SAC. Although not qualifying feature, potential for disturbance of grey seal at haul-out sites, depending on vessel route.
Outer Thames Estuary SPA and pSPA Extension	<ul style="list-style-type: none"> Wintering marine birds and breeding terns. 	East Anglia ONE North offshore cable corridor is within the SPA and pSPA extension. The East Anglia ONE North windfarm site is 1km from the SPA and pSPA.

Site	Features	Rationale
Greater Wash SPA	<ul style="list-style-type: none"> Non-breeding seabirds 	Proximity to the East Anglia ONE North windfarm site may result in small numbers of migratory non-breeding sea birds passing through the East Anglia ONE North windfarm site. Whilst breeding terns are a feature of the SPA, East Anglia ONE North windfarm site is beyond the maximum foraging range for breeding terns.
Alde-Ore Estuary SPA and Ramsar	<ul style="list-style-type: none"> Breeding seabirds and breeding, wintering and passage waterbirds 	Lesser black-backed gull and herring gull populations may have connectivity with East Anglia ONE North. This SPA holds the closest large colony of these species to East Anglia ONE North windfarm site, and some birds from that SPA may pass through East Anglia ONE North windfarm site during migration.
Flamborough and Filey Coast pSPA	<ul style="list-style-type: none"> Breeding seabirds 	Uncertain proportions of the kittiwake, gannet, common guillemot, razorbill and puffin populations most likely migrate through East Anglia ONE North windfarm site. Only gannet has potential for connectivity during the breeding season based on maximum foraging range but tracking data indicate no connectivity of breeding gannets. Potential connectivity due to uncertain proportions of the kittiwake, gannet, common guillemot, razorbill and puffin populations migrating through East Anglia ONE North windfarm site. Maximum foraging distances suggest only gannet has potential for connectivity during the breeding season but tracking data indicate no connectivity of breeding gannets.

10 References

- BEIS (2017) East Anglia THREE Habitats Regulations Assessment Decision. h
- Bradbury G., Trinder, M., Furness, R.W., Banks, A.N., Caldow, R.W.G. and Hume, D. (2014). 'Mapping seabird sensitivity to offshore wind farms', PLoS ONE, 9(9): e106366.
- Camphuysen, C.J. (1995). 'Herring gulls and lesser black-backed gulls feeding at fishing vessels in the breeding season: competitive scavenging versus efficient flying', Ardea, 83, 365-380.
- Camphuysen, C.J. (2013). A historical ecology of two closely related gull species (Laridae): multiple adaptations to a man-made environment. PhD thesis, University of Groningen.
- Carroll, M.J., Bolton, M., Owen, E., Anderson, G.Q.A., Mackley, E.K., Dunn, E.K. & Furness, R.W. (2017). Kittiwake breeding success in the southern North Sea correlates with prior sandeel fishing mortality. Aquatic Conservation doi: 10.1002/aqc.2780
- Cook A., Johnston A., Wright L., and Burton N. (2012). Strategic Ornithological Support Services Project SOSS-02. A review of flight heights and avoidance rates of birds in relation to offshore wind farms. Report of work carried out by the British Trust for Ornithology on behalf of The Crown Estate. May 2012.
- Coulson, J.C. (2017). Productivity of the black-legged kittiwake *Rissa tridactyla* required to maintain numbers. Bird Study 64, 84-89.
- Cunningham, L., Baxter, J. M., Boyd, I. L., Duck, C. D., Lonergan, M., Moss, S. E. & McConnell, B. (2009). Harbour seal movements and haul-out patterns; implications for monitoring and management. Aquatic Conservation: Marine and Freshwater Ecosystems, 19: 398 – 407.
- Department for Communities and Local Government (2006) Planning for the protection for European Sites: Appropriate Assessment.
- Department for Energy and Climate Change (2014) Record of the Habitats Regulations Assessment Undertaken Under Regulation 25 of the Offshore Marine Conservation Regulations 2007 (as Amended) for an Application Under the Planning Act 2008 (as Amended. East Anglia ONE.
- Department of Energy & Climate Change (2015) Guidelines on the assessment of transboundary impacts of energy development on Natura 2000 sites outside the UK.
- Diederichs *et al.* (2008). Methodologies for measuring and assessing potential changes in marine mammal behaviour, abundance or distribution arising from the construction, operation and decommissioning of offshore wind farms. Report commissioned by COWRIE Ltd.

English Nature (1997) Habitats Regulations Guidance Note 1. The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994.

English Nature (1999) Habitats Regulations Guidance Note 3. The Determination of Likely Significant Effect under The Conservation (Natural Habitats &c) Regulations 1994.

English Nature (2001) Habitats Regulations Guidance Note 4. Alone or in combination.

European Commission (2001) Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

European Commission (2011) Wind Energy Developments and Natura 2000. EU guidance on wind energy development in accordance with the EU nature legislation.

Fontaine, M.C., Baird, S.J.E., Piry, S., Ray, N. *et al.* (2007). Rise of oceanographic barriers in continuous populations of a cetacean: the genetic structure of harbour porpoises in Old World waters. *BMC Biology* 5: 30.

Fontaine, M.C., Roland, K., Calves, I., Austerlitz, F., Palstra, F.P., Tolley, K.A., Ryan, S., Ferreira, M., Jauniaux, T., Llavona, A. and Öztürk, B. (2014). Postglacial climate changes and rise of three ecotypes of harbour porpoises, *Phocoena phocoena*, in western Palearctic waters. *Molecular ecology*, 23(13), pp.3306-3321.

Frederiksen, M., Moe, B., Daunt, F., Phillips, R.A., Barrett, R.T., Bogdanova, M.I., Boulinier, T., Chardine, J.W., Chastel, O., Chivers, L.S., Christensen-Dalsgaard, S., Clement-Chastel, C., Colhoun, K., Freeman, R., Gaston, A.J., Gonzalez-Solis, J., Goutte, A., Gremillet, D., Guilford, T., Jensen, G.H., Krasnov, Y., Lorentsen, S.-H., Mallory, M.L., Newell, M., Olsen, B., Shaw, D., Steen, H., Strøm, H., Systad, G.H., Thorarinsson, T.L. & Anker-Nilssen, T. (2012). 'Multi-colony tracking reveals the winter distribution of a pelagic seabird on an ocean basin scale', *Diversity & Distribution*, 18, 530-542.

Furness, R.W., Wade, H. and Masden, E.A. (2013). 'Assessing vulnerability of seabird populations to offshore wind farms', *Journal of Environmental Management*, 119, 56-66.

Galloper Wind Farm Limited (GWFL) (2011) Galloper Wind Farm Project Habitats Regulations Assessment Report

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

Gill A., Gloyne-Phillips, I., Neal, K. and Kimber, J. (2005). The potential effects of electromagnetic fields generated by sub-sea power cables associated with offshore wind farm developments on electrically and magnetically sensitive marine organisms –

a review. Report to Collaborative Offshore Wind Research into the Environment (COWRIE) group, Crown Estates.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Boerjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M., Scheidat, M. and Teilmann, J. (2017). Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Wageningen Marine Research.

Hüppop, O., Dierschke, J., Exo, K-M., Fredrich, E. and Hill, R. (2006) 'Bird migration studies and potential collision risk with offshore wind turbines', Ibis, 148, 90-109.

IAMMWG (2015). Management Units for cetaceans in UK waters (January 2015). JNCC Report No. 547, JNCC Peterborough.

ICES (2013) Report of the Benchmark Workshop on Sandeel, 6-10 September 2010, Copenhagen, Denmark. ICES CM2010/ACOM:57, 185pp.

ITAP (2018) Offshore Wind Farm East Anglia Two: Prognosis of the expected hydro sound immissions during pile-driving work.

Joint Nature Conservation Committee (JNCC) (2009) Selection criteria and guiding principles for selection of special areas of conservation (SACs) for Marine Annex I Habitats and Annex II Species in the UK. Version 1.0 (11/05/09). JNCC, Peterborough.

Joint Nature Conservation Committee and Natural England (2013a). Suggested Tiers for Cumulative Impact Assessment, 12 September 2013. JNCC, Peterborough.

Joint Nature Conservation Committee and Natural England (2013b). Haisborough, Hammond and Winterton candidate Special Area of Conservation: Formal advice under Regulation 35(3) of The Conservation of Habitats and Species Regulations 2010 (as amended), and Regulation 18 of The Offshore Marine Conservation Regulations (Natural Habitats, &c.) Regulations 2007 (as amended). [Version 6.0 March 2013]. JNCC, Peterborough.

JNCC (2017) SAC Selection Assessment: Southern North Sea. January, 2017. Joint Nature Conservation Committee, UK. Available from: <http://jncc.defra.gov.uk/page-7243>.

JNCC. (2017a). A potential approach to assessing the significance of disturbance against conservation objectives of the harbour porpoise cSACs. Discussion document version 3.0.

JNCC. (2017b). Harbour porpoise SACs noise management stakeholder workshop. Report.

King, S., Maclean, I., Norman, T. and Prior, A. 2009. Development Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers. COWRIE.

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

Lindeboom, H. J., Kouwenhoven, H. J., Bergman, M. J. N., Bouma, S., Brasseur, S., Daan, R., Fijn, R. C., de Haan, Dirksen S.D., van Hal, R., Hille Ris Lambers, R., ter Hofstede, R., Krijgsveld, K.L., Leopold, M., and Scheidat. (2011). Short-term ecological effects of an offshore wind farm in the Dutch coastal zone; a compilation. Environ. Res. Lett. 6 035101.

Lowry, L.F., Frost, K.J., Hoep, J.M. and Delong, R.A. (2001). Movements of satellite-tagged subadult and adult harbor seals in Prince William Sound, Alaska. Marine Mammal Science 17(4): 835-861.

Lucke, K., Siebert, U., Lepper, P. A. and Blanchet, M. A. (2009). Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli, J. Acoust. Soc. Am., 125 (6), pp. 4060-4070.

MacArthur Green (2015) East Anglia THREE Chapter 13 Offshore Ornithology.

Maitland; P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Marine Scotland (MS) (2012). MS Offshore Renewables Research: Work Package A3: Request for advice about the displacement of marine mammals around operational offshore windfarms. Available at:
<http://www.gov.scot/Resource/0040/00404921.pdf>

McConnell, B.J., Chambers, C., Nicholas, K.S. and Fedak, M.A. (1992). Satellite tracking of grey seals (*Halichoerus grypus*). Journal of Zoology, 226(2), pp.271-282.

McConnell, B., Lonergan, M. and Dietz, R. (2012). Interactions between seals and offshore wind farms. The Crown Estate. ISBN: 978-1-906410-34-5.

Mitchell, P I, Newton, S, Ratcliffe, N. and Dunn, T E. (2004). Seabird populations of Britain and Ireland. London: T & AD Poyser.

Murray, S., Harris, M.P. and Wanless, S. (2015). 'The status of the gannet in Scotland in 2013-14', Scottish Birds, 35, 3-18.

Natural England and JNCC (2013) Advice on HRA screening for seabirds in the breeding season.

Natural England and JNCC (2015) Interim advice on HRA screening for seabirds in the non-breeding season.

Natural England and JNCC (2017) Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments.

NMFS (National Marine Fisheries Service) (2016). Technical guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept of Commer., NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p.

Normandeau, Exponent, Tricas, T. and Gill, A. (2011). Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. OCS Study BOEMRE 2011-09, U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, California
<https://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies/2011-09-EMF-Effects.aspx>

OSPAR (2009). Overview of the impacts of anthropogenic underwater sound in the marine environment. London: OSPAR Commission Biodiversity Series. Publication no. 441/2009. 133 pp.

Planning Inspectorate (2012a). Advice Note Nine: Using the Rochdale Envelope (Version 2), Planning Inspectorate, Bristol.

Planning Inspectorate (2012b) Report On The Implications For European Sites Galloper Wind Farm

Planning Inspectorate (2015). Advice Note Seventeen: Cumulative Effects Assessment (Version 1), Planning Inspectorate, Bristol.

Planning Inspectorate (2016). Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects (Version 7, January 2016). Planning Inspectorate, Bristol.

Popper, A. N., Hawkins, A. D., Fay, R. R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W. T., Gentry, R., Halvorsen, M. B., Løkkeborg, S., Rogers, P., Southall, B. L., Zedler, D., and Tavolga, W. N. (2014). Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report.

RenewableUK (2013) Cumulative Impact Assessment Guidelines. Guiding Principles for Cumulative Impacts Assessment In Offshore Wind Farms.

Royal HaskoningDHV (2017). Norfolk Vanguard Preliminary Environmental Information Report, Chapter 12 Marine Mammals. Available at:
<https://corporate.vattenfall.co.uk/globalassets/uk/projects/norfolk-vanguard/consultation-peir-oct-2017/peir/volume-1-peir-chapters/chapter-12-marine-mammals-norfolk-vanguard-peir.pdf>

Royal Society for the Protection of Birds (2012) Early post-breeding dispersal by adult gannets from Bempton Cliffs in September/October 2011.
http://www.rspb.org.uk/Images/Figure%2020postbreeding%202011_tcm9-311301.pdf

Ruddock, M. and D.P. Whitfield (2007) A Review of Disturbance Distances in Selected Bird Species A report from Natural Research (Projects) Ltd to Scottish Natural Heritage

Russell, D.J.F (2016). Movements of grey seal that haul out on the UK coast of the southern North Sea. Report for the Department of Energy and Climate Change (OESEA-14-47).

Russell, D.J.F. and McConnell, B.J. (2014). Seal at-sea distribution, movements and behaviour. Report to DECC. URN: 14D/085. March 2014 (final revision).

Russell, D.J.F., McConnell, B.J., Thompson, D., Duck, C.D., Morris, C., Harwood, J. and Matthiopoulos, J. (2013). Uncovering the links between foraging and breeding regions in a highly mobile mammal. *Journal of Applied Ecology*, Vol 50, no. 2, pp. 499-509.

Russell, D.J.F., Brasseur, S.M.J.M., Thompson, D., Hastie, G.D., Janik, V.M., Aarts, G., McClintock, B.T., Matthiopoulos, J., Moss, S.E.W. and McConnell, B. (2014). Marine mammals trace anthropogenic structures at sea. *Current Biology* Vol 24 No 14: R638–R639.

Russell, D.J.F., Hastie, G.D., Thompson, D., Janik, V.M., Hammond, P.S., Scott-Hayward, L.A.S., Matthiopoulos, J., Jones, E.L. and McConnell, B.J. (2016). Avoidance of wind farms by harbour seals is limited to pile driving activities. *Journal of Applied Ecology*: doi: 10.1111/1365-2664.12678.

Russell, D.J.F, Jones, E.L. and Morris, C.D. (2017) Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals. *Scottish Marine and Freshwater Science* Vol 8 No 25, 25pp. DOI: 10.7489/2027-1.

Scheidat, M., Tougaard, J., Brasseur, S., Carstensen, J., van Polanen Petel, T., Teilmann, J., and Reijnders, P. (2011). Harbour porpoise (*Phocoena phocoena*) and wind farms: a case study in the Dutch North Sea. *Environ. Res. Lett.* 6 (April-June 2011) 025102.

SCOS (2016). Scientific Advice on Matters Related to the Management of Seal Populations: 2016. Available at: <http://www.smru.st-andrews.ac.uk>

SCOS (2017). Scientific Advice on Matters Related to the Management of Seal Populations: 2017. Available at: <http://www.smru.st-andrews.ac.uk>

ScottishPower Renewables (2012). East Anglia ONE Environmental Statement.

Scottish Power Renewables (2014). East Anglia THREE Environmental Statement.

Scottish Power Renewables (2016a) East Anglia THREE Statement of Common Ground Rijkswaterstaat

Scottish Power Renewables (2016b) East Anglia THREE Information to support HRA report.

ScottishPower Renewables (2017a). East Anglia ONE North Scoping Report.
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010078/EN010078-000059-EAN2%20-%20Scoping%20Report.pdf>

ScottishPower Renewables (2017b) Marine Mammals Method Statement. Submitted to the Marine Mammals ETG May 2017 and discussed via ETG meeting on the 30th of May, 2017.

ScottishPower Renewables (2018) East Anglia TWO and East Anglia ONE North Wave Modelling Report. Benthic Expert Topic Group, 21st March, 2018.

Sharples, R.J., Moss, S.E., Patterson, T.A. and Hammond, P.S. (2012). Spatial Variation in Foraging Behaviour of a Marine Top Predator (*Phoca vitulina*) Determined by a Large-Scale Satellite Tagging Program. PLoS ONE 7(5): e37216.

Southall, B.L., Bowles, A.E., Ellison, W.T., Finneran, J.J., Gentry, R.L., Greene Jr., C.R., Kastak, D., Ketten, D.R., Miller, J.H., Nachtigall, P.E., Richardson, W.J., Thomas, J.A., and Tyack, P.L. (2007). Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals, 33 (4), pp. 411-509.

Strong, P. and Morris, S.R. (2010). Grey seal (*Halichoerus grypus*) disturbance, ecotourism and the Pembrokeshire Marine Code around Ramsey Island. J. Ecotourism 9(2): 117–132.

Teilmann, J., Carstensen, J., Dietz, R., Edrén, S. and Andersen, S. (2006). Final report on aerial monitoring of seals near Nysted Offshore Wind Farm Technical report to Energi E2 A/S. Ministry of the Environment Denmark.

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

Thaxter, C. B., Ross-Smith, V. H., Clark, N. A., Conway, G.J. Wade, H., Masden E.A., Rehfish, M.M., Bouten W. and Burton, N. H. K. (2012b) Measuring the interaction between marine features of Special Protection Areas with offshore wind farm development zones through telemetry: second year report. BTO Research Report No. 610.

Thaxter, C.B., Ross-Smith, V., Bouten, W., Clark, N.A., Conway, G.J., Rehfish, M.M. and Burton, N.H.K. (2015) Seabird-wind farm interactions during the breeding season vary within and between years: A case study of lesser black-backed gulls *Larus fuscus* in the UK, Biological Conservation, 186, 347-358.

Tolley, K.A. and Rosel, P.E. (2006). Population structure and historical demography of eastern North Atlantic harbour porpoises inferred through mtDNA sequences. Marine Ecology Progress Series, 327, pp.297-308.

Tougaard, J., Carstensen, J., Wisch, M.S., Teilmann, J., Bech, N., Skov, H. and Henriksen, O.D. (2005). Harbour porpoises on Horns reef—effects of the Horns Reef

Wind farm. Annual Status Report 2004 to Elsam. NERI, Roskilde (Also available at: www.hornsrev.dk).

Tougaard, J., Carstensen, J. and Teilmann, J. (2009a). Pile driving zone of responsiveness extends beyond 20km for harbour porpoises (*Phocoena phocoena* (L.)) (L). J. Acoust. Soc. Am., 126, pp. 11-14.

Tougaard, J., Henriksen, O.D. and Miller, L.A. (2009b). Underwater noise from three types of offshore wind turbines: estimation of impact zones for harbour porpoise and harbour seals. Journal of the Acoustic Society of America 125(6): 3766.

Tougaard, J., Buckland, S., Robinson, S. and Southall, B. (2013). An analysis of potential broad-scale impacts on harbour porpoise from proposed pile driving activities in the North Sea. Report of an expert group convened under the Habitats and Wild Birds Directive – Marine Evidence Group MB0138. 38pp.

Trinder, M. (2012) East Anglia ONE Offshore Wind Farm Lesser black-backed gull. PVA Report. Glasgow: MacArthur Green.

Vattenfall 2017, Norfolk Vanguard Preliminary Environmental Information Report.

Wakefield, E.D., Bodey, T.W., Bearhop, S., Blackburn, J., Colhoun, K., Davies, R., Dwyer, R.F., Green, J.A. Gremillet, D., Jackson, A.L., Jessopp, M.J., Kane, A., Langston, R.H.W., Lescroel, A., Murray, S., Le Nuz, M., Patrick, S.C., Peron, C., Soanes, L.M., Wanless, S., Votier, S.C. and Hamer, K.C. (2013) 'Space partitioning without territoriality in gannets', Science, 341, 68-70.

Walker, T.I. (2001) Basslink Project Review of Impacts of High Voltage Direct Current Sea Cables and Electrodes on Chondrichthyan Fauna and Other Marine Life. Report to NSR Environmental Consultants Pty Ltd, No. 20: 77.

Wilson, S. (2014). The impact of human disturbance at seal haul-outs. A literature review for the Seal Conservation Society.
<http://www.pinnipeds.org/attachments/article/199/Disturbance%20for%20SCS%20-%20text.pdf>.

Wright, L.J., Ross-Smith, V.H., Massimino, D., Dadam, D., Cook, A.S.C.P., and Burton, N.J.K. (2012) Assessing the risk of offshore wind farm development to migratory birds designated as features of UK Special Protection Areas (and other Annex 1 species). The Crown Estate Strategic Ornithological Support Services (SOSS) report SOSS-05.

WWT. (2012) SOSS-04 Gannet PVA Report. Slimbridge: Wildfowl and Wetlands Trust.

WWT. (2013) Migratory species collision risk modelling assessments. Slimbridge: Wildfowl and Wetlands Trust.

This page is intentionally blank.