PROGRAMME

DECOMMISSIONING PROGRAMME

Project	East Anglia ONE North Offshore Windfarm		
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REVISION SUMMARY

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1	08.10.2025	GoBe Consultants	Colin Macpherson	Alianis Sloan
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DESCRIPTION OF REVISIONS

Rev	Page	Section	Reason for issue	Description
1	All	All	Issued for Review	Working draft document.
2	All	All	Issued for Review	Issued to SPR for review on Aconex.
3	All	All	Issued for Review	Issued to SPR for review on Aconex.
4	All	All	Issued for Use	SPR comments addressed. First issue to DESNZ.

TABLE OF CONTENTS

ABBREVIATIONS

AA	Appropriate Assessment
AEZs	Archaeological Exclusion Zones
AtoN	Aids to Navigation
BEIS	Department for Business, Energy, and Industrial Strategy
BMAPA	British Marine Aggregate Producers Association
BPEO	Best Practicable Environmental Option
CPS	Cable Protection System
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
DOL	Depth of Lowering
dML	Deemed Marine Licences
DP	Decommissioning Programme
EA	East Anglia
EAONL	East Anglia ONE North Limited
EAZ	East Anglia Zone
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Co-operation Plan
ES	Environmental Statement
HSEx	Health, Safety and Environment
IAC	Inter Array Cables
IMO	International Maritime Organisation
km	Kilometres
kV	Kilovolt
LAT	Lowest Astronomical Tide
L x W x H	Length x Width x Height
MCA	Maritime and Coastguard Agency
MFE	Mass Flow Excavator
MMO	Marine Management Organisation
MW	Megawatts
NtM	Notice to Mariners
OFSS	Offshore Substation
OFTO	Offshore Transmission Owner
ORIEs	Offshore Renewable Energy Installations
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
ROV	Remotely Operated Vehicles
SAC	Special Area of Conservation

SCADA	Supervisory Control and Data Acquisition
SNS	Southern North Sea
SPA	Special Protection Areas
SPRUKL	ScottishPower Renewables UK Limited
UK	United Kingdom
UNCLOS	United Nations Convention on the Law of the Sea
WMP	Waste Management Plan
WTG	Wind Turbine Generators

1 INTRODUCTION

1.1 PROJECT OVERVIEW

East Anglia (EA) ONE North is an offshore windfarm being developed by EA ONE North Limited (EAONL) which is fully owned by ScottishPower Renewables UK Limited (SPRUKL). The original application for development consent for EA ONE North was submitted to the Planning Inspectorate by EAONL in November 2019, with a Development Consent Order (DCO) and associated deemed Marine Licences (dMLs) granted in April 2022 by the Secretary of State (SoS) for the Department for Business, Energy and Industrial Strategy (BEIS)[1]. Since consent was awarded, the DCO has been subject to a Correction Order in December 2022.

1.2 PURPOSE OF THE DECOMMISSIONING PROGRAMME

The expected operational lifetime of the Project is at least 25 years, depending on conditions during the Project's lifecycle. Towards the end of the expected operational lifetime a decision will be undertaken as to whether ongoing operations are feasible. This decision could extend the Project's lifecycle and subsequently postpone the decommissioning phase. At the end of its lifetime, the EA ONE North windfarm will be decommissioned.

This document forms the Decommissioning Programme (DP) and has been developed in order to discharge Schedule 1, Part 3, Condition 10 of the EA ONE North DCO, which states:

'No offshore works may commence until a written decommissioning programme in compliance with any notice served upon the undertaker by the Secretary of State pursuant to section 105(2) of the 2004 Act(a) has been submitted to the Secretary of State for approval'.

It is noted that as part of the offshore transmission licensing regime, elements of the windfarm relating to transmission assets are expected to be divested to a third-party Offshore Transmission Operator (OFTO) in the future. Following this, the DP will be modified to reflect this change in the EAONL's assets.

EAONL received notice under Section 105(2) of the Energy Act 2004 on the 20th Jan 2024. This notice requires that EAONL prepare and submit EA ONE North's DP to the SoS of the DESNZ no later than 31st Dec 2026.

It is noted that decommissioning of landfall works is covered by Part 3, Condition 27 (1) of the DCO. These requirements will be met separately in conjunction with the relevant planning authority and therefore are not discussed further in this document.

1.3 DOCUMENT STRUCTURE

The structure of this DP is outlined in Table 1-1.

Table 1-1 Document structure

Section	Overview
Section 1 – Introduction	Introduction to the document and consent requirements.
Section 2 – Background Information	Relevant background information, and a summary of environmental conditions across the site.
Section 3 – Description of Items to be Decommissioned	A full description of all items associated with the marine infrastructure to be decommissioned.
Section 4 – Description of Proposed Decommissioning Measures	An overview of the proposed approach to decommissioning the windfarm, including an overview of the process, details of items to be left *in situ*, proposed waste management solutions, and lighting and marking considerations.
Section 5 – Environmental Impact Assessment (EIA)	Details of the EIA that was prepared for EA ONE North and its consideration of decommissioning activities.

[1] BEIS existed until 2023 when it was split into several separate departments, including the Department for Energy Security and Net Zero (DESNZ) which it is now the relevant department.

Section	Overview
Section 6 – Consultation	The consultation process to be undertaken to support development and finalisation of the DP.
Section 7 – Costs and Financial Securities	Proposed strategy for providing details of the costs of decommissioning and the financial security which the companies that are party to the programme propose to provide.
Section 8 – Proposed Decommissioning Schedule	Details of the proposed decommissioning timescales.
Section 9 – Project Management and Verifications	Information on how EAONL will manage the implementation of the DP.
Section 10 – Seabed Left and Intended	Information relating to steps that will be taken in order to confirm that the seabed has been left as intended following decommissioning, including information on site surveys and schedules.
Section 11 – Restoration of the Site	Description of how EAONL intends to restore the site as far as reasonably practicable, to the condition that it was in prior to construction of the installation.
Section 12 – Post-decommissioning Monitoring, Maintenance and Management	Details of the post-decommissioning monitoring/activities that will be required, given that EAONL is not proposing to fully remove all infrastructure.

2 BACKGROUND INFORMATION

2.1 THE DEVELOPMENT

The EA ONE North site is located in the southern North Sea, within the East Anglia Zone (EAZ), situated approximately 33 km from the nearest point to the coast (located at Southwold) and 37 km from the Port of Lowestoft. Two export cables will make landfall North of Thorpeness in Suffolk. The windfarm site covers an area of approximately 203 km^2 and its location can be seen in Figure 2-1.

It is one of nine offshore zones belonging to the Crown Estate which formed part of the third licence round for United Kingdom (UK) offshore windfarms.

EA ONE North will be comprised of up to a maximum of 67 wind turbine generators (WTGs) and each have a maximum hub height of 175 m above Lowest Astronomical Tide (LAT) and a maximum total tip height of 282 m above LAT. The turbines will be mounted on transition pieces situated on monopile foundations.

A network of up to 200 km of 66 kV inter-array buried subsea cables will connect strings of wind turbines together and connect the wind turbines to the offshore substation. There will be a network of up to 152 km of offshore export cables.

The project will also include one offshore substation (OFSS) which collects the generated electricity from the windfarm and subsea export cables which take the electricity to landfall.

Further details of the project infrastructure that will be decommissioned are provided in Section 3 of this document.

400000
425000
450000
475000
5825000
5800000
5775000
N

ScottishPower Renewables

EA ONE NORTH
Decommissioning Programme

East Anglia ONE NORTH Offshore Windfarm Location

Legend

- EA1N Array Area
- Export Cable Corridor
- EA1N Works 1(a) and 1(b) Restricted Area *

* Schedule 1, Part 1, para 4: of the DCO prohibits Work No.1(a) or Work No. 1(b) from being carried out within 8 kilometres of the boundary of the Outer Thames Estuary Special Protection Area, as shown by the 'Works 1(a) and 1(b) Restricted Area'

Notes

Service Layer Credits: World Ocean Base: OceanWise, Esri, Garmin, NaturalVue
World Ocean Reference: Esri, TomTom, Garmin, FAO, NOAA, USGS
World Ocean Base: Esri, GEBCO, Garmin, NaturalVue

Datum: WGS84
Projection: UTM31N

0 5 10 km

0 2.5 5 nm

Scale	Date	Drawn by	Checked by	Approved by
1:300,000 @A3	19/08/2025	GB	JB	LS

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Figure 2-1

Figure Reference: EAH_0114_EA1N_DP_SiteLocation

2.2 SITE CHARACTERISTICS

This section provides a summary of the key characteristics of the offshore environment at the Project. The site characteristics are described by a comprehensive data set which was used to inform the Project EIA for the DCO application. A full summary of this information is described in the Environmental Statement (ES).

2.2.1 Offshore Physical Environment

2.2.1.1 Geology

As presented in Volume 1, Chapter 7: Marine Geology, Oceanography and Physical Processes of the ES, no site-specific geological surveys of the EA ONE North windfarm site have been conducted; however, Fugro EMU (2013) describes how the geology of the EAZ generally consists of Pleistocene sands and clays overlain by Holocene sand deposits. The thickness of the Holocene sediments of the EAZ varies from less than 1 m across most of the area to greater than 20 m in the sand wave fields and on the sand ridges, especially in the north of the Zone. The sand is marine and predominantly fine to medium grained with local laminae of mud.

The geology of the export cable corridor (ECC) close to the coast comprises mainly Coralline Crag Formation (cemented shelly sandstone) outcropping at the seabed This extends offshore for a maximum of about 3 km. Further offshore, Westkapelle Ground Formation overlies the Red Crag Formation. There is a buried channel up to 20 m deep infilled with Brown Bank Formation near the offshore end of the cable corridor.

2.2.1.2 Bathymetry and Topography

Water depths within the EA ONE North windfarm site vary from a minimum depth of 35 m below LAT to a maximum depth of 57 m below LAT.

The bathymetry of the EA ONE North windfarm site is dominated by relatively large areas of sand waves and megaripples located on north to south oriented shoals, separated by smaller areas of flatter deeper seabed. The largest sand waves are generally up to 10m high (with one reaching 16m) with wavelengths of 500-900m. The smaller sand waves are approximately 2-6m high with a wavelength of between 80m and 120m.

Crests range in orientation from southeast to northwest, to east to west. Most sand waves are asymmetrical, with the steeper flank facing northeast to north (indicating a prevailing current direction and sediment transport direction ranging from northeast and north). Megaripples and ripples are common throughout the windfarm site. However, there are several large areas where there are no bedforms. In the absence of bedforms, the seabed is flat with a few local irregularities dependent on the underlying geology, such as where London Clay sub-crops. Across these areas the seabed contains sets of north-northeast to south-southwest oriented striations.

Water depths across the offshore ECC vary from a minimum depth of 2 m below LAT inshore (across an area of outcropping rock), to a maximum depth of 61 m below LAT at the seaward end. Closest to the coast, the bathymetry of the ECC is dominated by rock outcrop (Coralline Crag) with an irregular surface formed of southwest-northeast oriented ridges between 0.5 m and 3 m high. East of the rock outcrop is an area of featureless seabed formed of gravelly sands as a veneer over harder substrate (which is exposed in places), cut by a suite of trawl scars.

Further offshore the hard substrate is deeper sub-seabed, and the bathymetry is dominated by an irregular area of megaripples composed of gravelly sand, with some sand waves. The larger bedforms are predominantly oriented between west to east and west-northwest to east-southeast and are generally up to 4.5m high (although a height of 9.5m was recorded) with wavelengths of 20-140 m.

East of the point where the cable becomes oriented west to east, the seabed is generally featureless with irregular low-lying mounds up to 0.5m high. Patches of megaripples with occasional sand waves do occur oriented between west- northwest to east southeast and west to east. The megaripples are generally less than 0.2m high and exhibit wavelengths of 3-12m.

The eastern end of the offshore cable corridor is dominated by two channels; a western channel oriented north-south and an eastern channel adjacent to the windfarm site oriented north-northeast to south-southwest, where the maximum depth of 61m below LAT was recorded. Both channels contain some west to east, or west-northwest to east-southeast oriented sand waves, between 2m and 12m high, with wavelengths of 50-300m.

2.2.1.3 Metocean Characteristics

2.2.1.3.1 Wind and Wave Regimes

The EA ONE North windfarm site, and the former EAZ in general, is within a micro-tidal regime. The average spring tidal range varies between 0.1 m and 2.0 m (East Anglia Offshore Wind, 2012) and typically weakens towards deeper areas.

This relatively low tidal range is due to general proximity to an amphidromic point in the southern North Sea that is positioned just outside the central, eastern boundary of the former EAZ. Due to this, the tidal range across the windfarm site is modest (0.5 m - 1.2 m) and not extreme. At the amphidromic point, the tidal range is near zero. The tidal range then increases with radial distance from this point.

At the coast, the tidal range reaches 2.55 m on mean spring tides at Sizewell (just to the north of the ECC landfall).

The North Sea is particularly susceptible to storm surges and water levels can become elevated around 2.05 m above astronomical tidal levels during a one year return period surge event, and around 3.09 m during a 100-year return period surge event, as measured at Sizewell.

A study conducted by MetOceanWorks (2020) determined that wind speeds at the EA ONE North location at 10 m height originate mainly from the southwest, with a mean annual wind speed of approximately 8.0 m/s.

2.2.1.3.2 Tidal Processes

Within the EA ONE North windfarm site, tidal currents are strongest across the west of the site, reaching up to 1.4 m/s on spring tides and 0.9 m/s on neap tides at an Admiralty Diamond close to the ECC. Tidal streams are directed towards the south-southwest on a flooding tide and towards the north-northeast on the ebbing tide. Speeds reduce to around 0.7 m/s on spring tides and 0.4 m/s on neap tides in shallow water just off the Suffolk coast.

The southern North Sea is prone to storm surges, with a predicted maximum surge current of 0.4 m/s (Health, Safety and Executive (HSEx), 2002, as cited in Volume 1, Chapter 7 Marine Geology, Oceanography and Physical Processes of the ES). Whilst this is less than the typical daily current speeds recorded within the EA ONE North windfarm site and ECC, surge currents can combine with tidal currents to create faster overall currents.

2.2.2 Offshore Biological Environment

2.2.2.1 Benthic Environment

As presented in Volume 1, Chapter 9: Benthic Ecology of the ES, the predominant habitats are sands and gravels in both the EA ONE North site and ECC, and these determine infaunal and epifaunal communities which are present. Such communities are dominated by polychaetes, such as *Spiophanes bombyx* and *Nephtys cirrosa*, as well as echinoderms, such as *Ophiuroidea sp*. The homogeneity of the benthic ecology across the majority of the EA ONE North site is evident by the fact that only three different infaunal communities were identified as present, all of which were extremely similar. In the nearshore area, the sediments have a higher proportion of silts, with species such as the mud shrimp *Corophium valuator*, hydroids *Sertularia cupressina* and *Vesicularia spinosa* and polychaetes *Notomastus spp.* and *Eunereis longissima* dominating.

The only protected species associated within the EA ONE North site and ECC is *Sabellaria spinulosa,* which is a tube-building polychaete worm that is found in the subtidal and lower intertidal/sublittoral fringe. *S spinulosa* may form reefs, however, this is not an obligate growth form. It is these reef structures that are

protected (pursuant to section 41 of the Natural Environment and Rural Communities Act (2006) and not the species itself; importantly crusts and veneers do not qualify as reefs.

Grab data obtained in 2012 for the EAZ indicated seven locations where potential reef may be present, with non-reef forming *S.* spinulosa found more widely across the region. No evidence of reef was recorded within the ECC during the characterisation surveys to inform the ES.

2.2.2.2 Fish and Shellfish

As presented in Volume 1, Chapter 10: Fish and Shellfish Ecology, site specific surveys and desktop studies were undertaken to inform the EA ONE North ES. The ES describes the fish and shellfish species identified as being present within the EA ONE North Site and ECC as relatively common and widespread across the southern North Sea. Species of note include several commercial species, such as sandeel *Ammodytes* spp. and *Hyperoplus lanceolatus*, Atlantic herring *Clupea harengus,* mackerel *Scomber scombrus*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus*, cod *Gadus morhua*, plaice *Pleuronectes platessa*, lobster *Homarus gammarus*, scallops *Pecten maximus*, common whelks *Buccinum undatum,* brown shrimp *Crangon crangon*, pink shrimp *Pandalus montagui* and edible crab *Cancer pagurus*. This broadly aligns with the species represented in recent MMO landings data (2025).

Spawning and nursery grounds have been defined for several species, including cod, plaice, sole, whiting, lemon sole, herring, mackerel, sprat, sandeel, thornback ray, top and spurdog. within and in the vicinity of the EA ONE North site and ECC. Elasmobranch and diadromous fish species potentially use areas within or in the vicinity of the EA ONE North site and ECC. These spawning and nursery grounds are summarised in Figure 2-2.

Species	Spawning season and intensity in the offshore development area												Nursery Grounds	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	East Anglia ONE North windfarm site	Offshore cable corridor
Plaice	•	•											n/a	
Dover sole				•									n/a	
Cod		•	•											
Lemon sole														
Whiting													n/a	n/a
Mackerel*					•	•	•							
Sandeel sp.														
Sprat					•	•								
Herring*													n/a	
Thornback ray				•	•	•	•	•					n/a	
Tope	Gravid females present year round													

Spawning times and Intensity colour key: orange= high intensity spawning / nursery ground, yellow= low intensity spawning / nursery grounds, grey= unknown spawning / nursery grounds, • = peak spawning, n/a= no overlap with spawning/nursery grounds
*For these species there is no overlap with spawning grounds however they are within close proximity to the offshore development area

Figure 2-2 Summary of EA ONE North spawning and nursery grounds that overlap with the array and ECC

2.2.2.3 Ornithology

As presented in Volume 1, Chapter 12: Offshore Ornithology, the following species were reported to be present within the EA ONE North site: red-throated diver *Gavia stellata*, Great northern diver *Gavia immer*, fulmar *Fulmarus glacialis*, gannet *Morus bassanus*, arctic skua *Stercorarius parasiticus*, great skua *S. skua*, lesser black-backed gull *Larus fuscus*, herring gull *L. argentatus*, great black-backed gull *L. marinus*, kittiwake *Rissa tridactyla*, common tern *Sterna hirundo*, guillemot *Uria aalge*, razorbill *Alca torda* and puffin *Fratercula arctica*. All these species are listed as EC Birds Directive Migratory Species. For the ECC, no site-specific surveys

were completed and only one species has been assessed, red-throated diver, with data provided from a Special Protection Area (SPA) study commissioned by Natural England.

During the breeding season only kittiwake and lesser black-backed gull exceeded the threshold for regionally important numbers, and no species were present in nationally or internationally important numbers. During winter red-throated diver (EC Birds Directive Annex I Species), fulmar, kittiwake, lesser black-backed gull, guillemot and razorbill (all EC Birds Directive Migratory Species) exceeded the threshold for regionally important numbers, and no species were present in nationally or internationally important numbers.

Nature conservation designated sites as relevant to EA ONE North, including SPA's are described in Section 2.2.3 of this document.

2.2.2.4 Marine Mammals

As presented in the ES, the diversity and abundance of marine mammal species found within the southern North Sea is relatively low. There are three marine mammal species that occur regularly within the region around EA ONE North; these species are grey seal *Halichoerus grypus,* harbour seal *Phoca vitulina* and harbour porpoise *Phocoena phocoena*.

Harbour porpoise is the most commonly sighted cetacean in the North Sea, and is the cetacean most frequently observed in the EA ONE North site and ECC, based on boat and aerial survey data. Grey seal and harbour seal are also commonly seen within the North Sea, however the use of EA ONE North by these species is low, based on boat surveys.

2.2.3 Nature Conservation Designations

2.2.3.1 European Sites

Table 2-1 provides information of European sites screened into the Report to Inform an Appropriate Assessment (RIAA).

Table 2-1 European Sites considered in the RIAA

Site name	Area	Site description	Conservations objectives	Distance to EA ONE North
Southern North Sea Special Area of Conservation (SAC)	36,951 km^2	The Southern North Sea SAC has been identified as an area of importance for harbour porpoise (*Phocoena phocoena*). This site stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south. The majority of the site lies offshore, though it does extend into coastal areas of Norfolk and Suffolk crossing the 12 nm boundary. The SAC ranges in depth from Mean Low Water down to 75 m, with most of it shallower than 40 m, and is characterised by its sandy, coarse sediments which cover much of the site. The SAC is divided into seasonal components which correlate to area in which persistently high densities of harbour porpoise are recorded. These areas are defined as summer (April to September inclusive), and winter (October to March inclusive). The assumption is that sites are used differently during summer, and winter presumably driven by shifts in prey/prey preferences.	To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to maintaining the Favourable Conservation Status (FCS) for the harbour porpoise. To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term: • The species is a viable component of the site; • There is no significant disturbance of the species; and • The supporting habitats.	0 km
Outer Thames Estuary SPA	3,924 km^2	The Outer Thames Estuary SPA is classified for the protection of the largest aggregation of wintering red-throated diver (*Gavia stellata*) in the UK, an estimated population of 6,466 individuals, which is 38% of the wintering population in the UK. It also protects foraging areas for common tern (*Sterna hirundo*) (2.66% of UK population (2011 - 2015)) and little tern (*Sternula albifrons*) (19.64% of UK population (2011 - 2015)) during the breeding season.	The conservation objectives for the protected features of the SPA are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and • The distribution of qualifying features within the site.	0 km
The Sandlings SPA	33.91 km^2	The Sandlings SPA lies near the Suffolk Coast between the Deben Estuary and Leiston. It lies within the Suffolk Coast and Heaths National Character Area (NCA) a mainly flat or gently rolling	The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified.	0 km

Site name	Area	Site description	Conservations objectives	Distance to EA ONE North
		landscape that forms a long, narrow band extending between 10 and 20 km inland. It is often open land but with few commanding viewpoints. In many places, and especially near the coast, wildlife habitats and landscape features lie in an intimate mosaic, providing great diversity in a small area. Much of the NCA forms part of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB).	The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and • The distribution of qualifying features within the site.	
Alde-Ore Estuary SPA and Ramsar site	24.04 km^2	The Alde-Ore Estuary SPA sustains nationally important numbers of: • Marsh Harrier (*Circus aeruginosus)* at least 1.9% of the GB breeding population 5 year mean, 1993-1997 • Avocet *(Recurvirostra avosetta)* (Western Europe/Western Mediterranean – non- breeding) 23.1% of the GB breeding population5 year mean,1990-1994 • Little tern (*Sterna albifrons)* (Eastern Atlantic – breeding) 2% of the GB breeding population 5 count mean,1993-4,1996-8 • Sandwich tern (Ste*rna sandvicensis)* (Western Europe/Western Africa) 1.2% of the GB breeding population 5-year mean, 1992-1996. Over winter the area regularly supports: • Ruff *(Philomachus pugnax)* (Western Africa -wintering) 0.4% of the GB population 5 year peak mean 1991/92-1995/96 • Avocet (*Recurvirostra avosetta*) (Western Europe/Western Mediterranean - breeding) 60.3% of the GB population 5 year peak mean 1991/92-1995/96 Additional species that breed on the site include: • During the breeding season the area regularly supports: Lesser black back gull (*Larus fuscus)* (Western Europe/Mediterranean/Western Africa) 11.3% of the breeding population 5 year mean 1994-1998	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the FCS of its Qualifying Features, by maintaining or restoring; • The extent and distribution of qualifying natural habitats; • The structure and function (including typical species) of qualifying natural habitats; and • The supporting processes on which qualifying natural habitats rely.	0 km

Site name	Area	Site description	Conservations objectives	Distance to EA ONE North
		• Over winter the area regularly supports: Redshank (*Tringa tetanus)* (Eastern Atlantic - wintering) 1.1% of the population 5 year peak mean 1991/92-1995/96		
Greater Wash SPA	3, 536 km^2	The Greater Wash SPA is located in the mid-southern North Sea between Bridlington Bay in the north and the Outer Thames Estuary SPA in the south. The SPA boundary encompasses offshore areas identified as containing high densities or encompassing breeding season foraging ranges of the qualifying bird species. To the north, off the Holderness coast in Yorkshire, seabed habitats primarily comprise coarse sediments, with occasional areas of sand, mud and mixed sediments. Subtidal sandbanks occur at the mouth of the Humber Estuary, primarily comprising sand and coarse sediments. Offshore, soft sediments dominate, with extensive areas of subtidal sandbanks off The Wash as well as north and east Norfolk coasts. Closer inshore at The Wash and north Norfolk coast, sediments comprise a mosaic of sand, muddy sand, mixed sediments and coarse sediments, as well as occasional Annex I reefs. The area off the Suffolk coast continues the mosaic habitats mostly dominated by soft sediment.	The Conservation Objectives for the site are: "*With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change; Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; The extent and distribution of the habitats of the qualifying features The structure and function of the habitats of the qualifying features The supporting processes on which the habitats of the qualifying features rely The population of each of the qualifying features, and, The distribution of the qualifying features within the site".*	23 km
Broadland SPA and Ramsar site	55 km^2	Broadland is a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk in eastern England. The Broads are a series of flooded medieval peat cuttings. They lie within the floodplains of five principal river systems, known as Broadland. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The distinctive open landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh, tall herb fen, transition mire and fen meadow, forming one of the finest marshland complexes in the UK. The differing types of management of the vegetation for reed, sedge and marsh hay, coupled with variations in hydrology and substrate, support an extremely diverse range of plant communities. The area is of international importance for a variety of wintering and breeding raptors and waterbirds associated with extensive lowland marshes.	The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above). The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and • The distribution of qualifying features within the site.	21 km

Site name	Area	Site description	Conservations objectives	Distance to EA ONE North
Breydon Water SPA and Ramsar site	12 km^2	Breydon Water SPA was classified in 1996; however a boundary extension was added in 2000 to incorporate Halvergate marshes. Breydon Water SSSI and Halvergate Marshes SSSI are the constituent sites of the Breydon Water SPA and together include the landward extension of the Breydon Water SPA. With the extension, the SPA now covers 1202.94 ha and its hinterland lie within the Broads, one of the family of National Parks. The estuary forms the lower reaches of the Yare and Waveney rivers, which drain most of central EA. At high tide Breydon Water forms a large water body and as the tide recedes, remaining water forms a narrow channel. The SPA incorporates a number of important supporting habitats such as, intertidal mudflats, saltmarsh and freshwater grazing marsh. The grazing marshes that lie on the landward side of the seawall on Breydon Water SSSI and Halvergate Marshes SSSI are not covered by the highest astronomical tide and therefore lie outside the boundary of Breydon Water European Marine Site.	The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above). The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and • The distribution of qualifying features within the site.	34 km
North Norfolk Coast SPA and Ramsar site	78.86 km^2	This SPA is located east of The Wash on the northern coastline of Norfolk, eastern England. The SPA covers 7886.79 ha and extends 40km from Holme to Weybourne and includes a great variety of coastal habitats; intertidal mudflats and sandflats, coastal waters, saltmarshes, shingle, sand dunes, freshwater grazing marshes and reedbeds. The site is important within Europe as one of the largest areas of undeveloped coastal habitat of its type. It is the fourth most important wetland site for waterfowl in Britain. The site is particularly important for saltmarsh containing some of the best examples of this habitat type in Europe.	The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above). The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and • The distribution of qualifying features within the site.	87 km

Site name	Area	Site description	Conservations objectives	Distance to EA ONE North
The Wash and North Norfolk Coast SAC	32 km^2	The North Norfolk Coast SAC has an area of 3,207.37 ha and is located to the east of The Wash embayment on the East coast of England. The Annex I habitats that are marine features of the site include coastal lagoons and Mediterranean and thermo-Atlantic halophilous scrub, both of which are listed as primary reasons for selection of the site. Otter is the only Annex II species listed as a qualifying feature of the site. Coastal lagoons are a priority habitat and are relatively uncommon in the UK. They can increase biodiversity and provide important habitats for breeding and overwintering birds; for this reason, much of the coastal lagoon resource within the UK has been included in the SAC series. The North Norfolk Coast SAC was designated for percolation lagoons and together with the Orfordness-Shingle Street SAC and the Benacre-Eastern Bavents SAC, forms a significant part of the percolation lagoon resource in this part of the UK. Percolation lagoons are separated from the sea by shingle banks but allow sea water to enter by percolating through the shingle or by over-topping the bank (e.g. in storms). Salinity in the lagoons is maintained by this percolation of seawater through the beach or dune barrier with the substrate located at the bottom of the lagoons being generally made up of shingle covered by mud.	The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above). The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of the qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of the qualifying species; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of each of the qualifying species; and • The distribution of qualifying species within the site.	87 km
Humber Estuary SAC	376 km^2	The Humber Estuary SAC extends about 70 km from the mouth of the Humber, past the ports of Grimsby, Immingham, Hull and Goole and up to the limit of saline intrusion on the rivers Ouse and Trent and covers an area of around 366.57 km^2.	The conservation objectives for the site are as follows: *"The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: the extent and distribution of qualifying natural habitats and habitats of the qualifying species; the structure and function (including typical species) of qualifying natural habitats; the structure and function of the habitats of the qualifying species; the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; the populations of each of the qualifying species; and the distribution of qualifying species within the site".*	164 km

Site name	Area	Site description	Conservations objectives	Distance to EA ONE North
Flamborough and Filey Coast SPA	78.5 km^2	Flamborough and Filey Coast SPA is located on the Yorkshire coast between Bridlington and Scarborough. The site has been designated due to its importance by supporting over 1% of the biogeographical populations of four regularly occurring migratory species and a breeding seabird assemblage of European importance. This includes: • Black-legged kittiwake *Rissa tridactyla,* represents 2% of the North Atlantic subspecies • Northern gannet *Morus bassanus* represents 2.6% North Atlantic • Common guillemot *Uria aalge* represents 15.6% of the subspecies population (*Uria aalge albionis*); • Razorbill *Alca torda* represents 2.3% of the subspecies population (*Alca torda islandica*)	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; • The extent and distribution of the habitats of the qualifying features • The structure and function of the habitats of the qualifying features • The supporting processes on which the habitats of the qualifying features rely; • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.	237 km

2.2.3.2 Marine Conservations Zones (MCZs)

The closest MCZ to EA ONE North is the Orford Inshore MCZ at 11.4 km from the ECC. It was predicted that there would be no potential for activities to adversely impact upon the sites' designated features of subtidal mixed sand and gravels. This is due to a lack of physical overlap and negligible impact in the far-field as a result of an increase in suspended sediment concentrations during construction. Therefore, it was concluded that there would be, at worst, negligible impact from indirect effects and no adverse effect on the site.

2.2.3.3 Sites of Special Scientific Interest (SSSI)

EA ONE North landfall overlaps with the Leiston – Aldeburgh SSSI. Landfall will be made using a horizontal directional drill and therefore there are no direct or indirect impacts on the intertidal zone and this SSSI was not considered further in the ES.

2.2.4 Offshore Human Environment

A summary of the key receptors concerning the human environment for EA ONE North are provided within this section.

2.2.4.1 Existing and Planned Installations in the Vicinity

2.2.4.1.1 Offshore Wind

As presented in the Volume 1, Chapter 17: Infrastructure and Other Users of the ES, the UK waters of the SNS is an area of significant offshore wind development activity, having been subject to several phases of offshore wind development. A summary of all offshore windfarm developments within close proximity to EA ONE North (within 50 km) are presented below.

Table 2-2 Summary of offshore windfarm developments within 50 km of EA ONE North

Name	Status	EA ONE North ECC (km)	EA ONE North Array (km)
Five Estuaries	In Planning	32.82	36.01
Galloper	Operational	27.50	38.79
Greater Gabbard	Operational	27.25	43.26
Scroby Sands	Operational	33.39	40.71
North Vanguard West	Construction	49.69	40.91
EA TWO	Pre-construction	10.08	10.44
EA ONE	Operational	9.47	1.30
EA THREE	Construction	0	16.64
North Vanguard East	Construction	52.96	38.15
IJmuiden Ver	Planning	66.17	47.25

2.2.4.1.2 Oil and Gas

There is no surface or subsurface infrastructure in the EA ONE North windfarm site. Within 40 km of the EA ONE North offshore development area there are 12 wells, with the closest being 4.6 km away. However, these wells are of 'plugged' or 'abandoned' status and will 'never be used or re-entered again' (Oil and Gas Authority 2018). The Bacton Zeebrugge interconnector gas pipeline runs northwest to southeast and intersects the offshore cable corridor (and thus will require up to two crossings).

No licensed blocks for oil and gas overlap the offshore development area.

2.2.4.1.3 Subsea Telecommunications and Power Cables

The southern North Sea has a high density of sub-sea cabling that provides links between the UK, continental Europe and beyond. There are two active telecommunications cables that run through the EA ONE North ECC.

Several out of service subsea cables are known to run through EA ONE North. Eight cables that are in planning or are operational intersect with the offshore development area.

The routes of the three Greater Gabbard Offshore Wind Farm offshore export cables and the three proposed Galloper offshore windfarm export cables would cross the EA ONE North ECC from north to south. This would require up to 30 cable crossings assuming a worst case of four EA ONE North offshore export cables installed within the ECC. The worst case for total number of cable crossings includes contingency for potential discoveries and are as follows:

- Export cable: 30 crossings;
- Platform link cables: 30 crossings; and
- Inter-array cables: 25 crossings

In addition, there are likely to be disused cables that date from over 100 years ago, many of which are now lost or not shown on charts and represent a risk to seabed activity. Modern charts only display cables decommissioned since 1987.

Only two export cables are currently proposed for EA ONE North, in turn the number or cable crossings is anticipated to be refined down following detailed design.

2.2.4.2 Navigation

As presented in Volume 1, Chapter 14 Shipping and Navigation, the key navigational features within the area are considered to be the IMO routeing measures, most notably the Deep Water Route passing through the shipping and navigation study area, passing the EA ONE North windfarm site with a consistent 1 nm separation distance.

There were no charted anchorages identified within the study areas, or any areas mentioned within the Admiralty Sailing Directions, however it should be noted that the marine traffic survey data recorded anchoring activity within the area. This activity was likely associated with the Southwold Oil Transhipment Area, located within 0.7 nm of the offshore ECC.

There are no designated Ministry of Defence Practice and Exercise Areas within the sea area surrounding the EA ONE North windfarm site. In addition, there are no Marine Environmental High Risk Areas in the immediate vicinity of the windfarm site.

Based upon marine traffic survey data presented in the ES, shipping in the vicinity of EA ONE North includes commercial shipping, fishing and recreational vessels. During the summer survey, an average of 116 vessels per day passed within the shipping and navigation study area, recorded on Automatic Identified System and Radar. During winter, this dropped to an average of 101 vessels per day. The majority of this traffic was comprised of cargo vessels (42% during summer and 47% in winter) and tankers (30% during summer and 40% in winter). It should be noted that this includes commercial cargo ferries.

Cargo vessels were recorded transiting routes to the east and west of the EA ONE North windfarm site. General cargo vessels (34%) and Ro Ro cargo vessels with container capacity (28%) were the most frequently recorded cargo vessel types transiting through the shipping and navigation study area, followed by containerships (19%). Bulk carriers (16%) were also recorded frequently.

The majority of tankers were recorded transiting routes to the east and west of the EA ONE North windfarm site. Combined chemical and oil tankers (36%) were the most frequently recorded tanker type transiting through the shipping and navigation study area, followed by crude oil tankers (19%) and Liquid Petroleum Gas (LPG) carriers (19%). A number of tankers were recorded within the Southwold Oil Transhipment Area within the west of the shipping and navigation study area. Passenger vessel (including ferries and cruise liners) traffic was also identified within the shipping and navigation study area. Regular passenger vessel transits were recorded to the northeast, east and west of the EA ONE North windfarm site.

Approximately six recreational vessels per day were recorded during the summer survey, with the majority of these being sailing vessels. Activity was much lower in winter, with only one vessel recorded over the 14 day surveyed period. An average of two fishing vessels per day were recorded within the study area during summer. The vessels within the site were considered likely to be in transit rather than actively engaged in fishing based on their behaviour. During winter, four fishing vessels per day were recorded within the study area. This included active fishing within both the EA ONE North and EA ONE windfarm sites. However, It should be considered that increased construction vessel activity at the EA ONE windfarm site may have displaced fishing activity during the EA ONE North summer survey alongside typical seasonal variations

2.2.4.3 Commercial Fishing

As presented in Volume 1, Chapter 13 Commercial Fisheries, the EA ONE North ES confirms that sightings of commercial fishing vessels are comprised principally of UK, Dutch and Belgian vessels, with considerably lower numbers of French and German vessels observed. The ES primarily uses data from 2011 to 2017; however, where relevant, more recent fishing data has been cross referenced. The ES refers to fisheries data from the following International Council for the Exploration of the Sea. (ICES) rectangles, this information has been utilised for informing this baseline:

- In rectangle 33F1, where the inshore section of the offshore cable corridor is located; and
- In rectangle 33F2, where the offshore section of the offshore cable corridor and the EA ONE North windfarm site are located.

An overview of the principal fishing fleets and methods operating in the offshore development area is given based on analysis of MMO surveillance sightings from 2011 and 2017 by method and nationality 2011 to 2017.

In rectangle 33F1, most surveillance sightings are of UK vessels, principally potters /whelkers, followed by trawlers, long liners and netters. French trawlers and Belgian beam trawlers have also been observed in this inshore rectangle in some numbers with vessels from other nationalities showing negligible records. In this context it is important to note that both French and Belgian vessels hold historic fishing rights within this rectangle, being allowed to fish within the UK's 6 and 12 nm limit in this area.

In rectangle 33F2, the majority of surveillance sightings are of Dutch and Belgian vessels, primarily beam trawlers and trawlers (unspecified). Albeit at comparatively lower levels, sightings of vessels from various other nationalities have also been recorded in the study area in areas beyond the UK's 12 nm limit, particularly German beam trawlers and Danish trawlers

The majority of local UK vessels active in the vicinity of the offshore development area are of under 10 m in length. Many of these are multipurpose having the ability to deploy multiple gears. The principal methods used by these vessels include potting, netting, long lining and trawling and target shellfish species (lobster *Homarus gammarus,* edible crab *Cancer pagurus* and whelk *Buccinum undatum*) as well as fish species such as sole, plaice, rays, cod Gadus morhua and bass. By virtue of their small size and associated limited operational range, these vessels primarily operate within the 12 nm limit (and mostly within the 6nm limit) and therefore in areas relevant to of the inshore section of the ECC (within rectangle 33F1). Various vessels are however known to target areas further offshore, including areas as far out as the EA ONE North windfarm site. However, in offshore areas within the study area (rectangle 33F2), the majority of landings are from larger vessels (over 15 m), mainly beam trawlers targeting flatfish species such as sole and plaice.

2.2.4.4 Offshore Archaeological and Cultural Heritage

As presented in Volume 1, Chapter 16 Marine Archaeology and Cultural Heritage, comprehensive archaeological assessments are included and have been summarised in the offshore Written Scheme of Archaeological Investigation (WSI) (EA1N-CST-CNS-COM-IBR-000001), which has been approved by the MMO (in consultation with Historic England under the EA ONE North dMLs).

A geophysical survey campaign has been undertaken, and shallow geological (palaeolandscape) features of archaeological interest were differentiated in accordance with the definitions set out below.

Criteria discriminating relevance of shallow geological features:

- P1 Feature of probable archaeological interest, either because of its palaeography or likelihood for producing paleoenvironmental material; and
- P2 Feature of possible archaeological interest.

Seabed features of archaeological interest were differentiated in accordance with the definitions set out below:

- A1/High: Anthropogenic origin of archaeological interest;
- A2/Medium/Low: Uncertain origin of possible archaeological interest; and
- A3: Historic record of possible archaeological interest – United Kingdom Hydrographic Office reference to feature that shows no trace on seabed.

In the case of archaeological discovery during the Decommissioning, contractors are to implement the Protocol for Archaeological Discoveries (PAD) (EA1N-GEN-ENV-PRO-IBR-000003) (or its equivalent at the time of decommissioning). The PAD will confirm the roles and responsibilities, reporting process and actions that must be taken by the Contractor or Project Personnel in the event of an unexpected or incidental find relating to the historic environment. The aim of the PAD is to monitor and manage unexpected or incidental archaeological finds to mitigate any adverse effects of the development of offshore wind projects upon the historic environment and to ensure that the cultural heritage is understood and protected accordingly. In addition, the Project will consider, in consultation with Historic England, the need for a Decommissioning Archaeological Method Statement to outline how such above measures will be met in good time ahead of work commencing, together with Programmes for post-decommissioning monitoring requirements.

2.2.4.5 Dredging, Dumping and Disposal

No aggregate dredging areas exist within the proposed EA ONE North project boundaries. The closest dredging area is the Southwold East which lies 17.5 km west of the EA ONE North array and 3.6 km to the north of the ECC.

EA ONE North has three designated disposal sites. TH082 which overlaps with the north ECC, TH087 which overlaps the EA ONE North and EA TWO shared nearshore ECC and, TH083 and HU212, which both partially overlap with the array; these are licenced under the dMLs.

EA ONE North is permitted to dispose of drill arisings and material extracted during seabed preparation activities. Should disposal sites require reopening for decommissioning works, appropriate licencing requirements will be met, including consideration of potential impacts and any need for contaminant sampling.

2.2.4.6 Civil Aviation and Ministry of Defence

The airspace above the EA ONE North windfarm site from sea level to FL195 is uncontrolled and classified as Class G airspace. The uncontrolled airspace immediately above the EA ONE North windfarm site is transited by most types of civilian aircraft operating, quite legitimately, ‘off route’ and is also used by military aircraft for general training and exercise purposes. Additionally, the broad area is crossed by a number of HMRs that serve the offshore oil and gas industry platforms in the southern North Sea.

The windfarm site also overlaps with the Lakenheath South Aerial Tactics Area. Aerial Tactics Areas are areas of intense military activity including Air Combat Training, and civilian pilots are advised to avoid these areas. The northern two thirds of the windfarm site lies beneath Air to Air Refuelling Area 9, within which helicopter refuelling activities take place.

To the north-west and south-west, Class D controlled airspace is established around the airports at Norwich and Southend respectively. Class D controlled airspace is established in order to provide protection to aircraft arriving and departing from aerodromes and from other aircraft operations. The most easterly point of EA ONE North windfarm site boundary is 6.5 km west of the London / Amsterdam Flight Information Region.

3 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

At the end of EA ONE North’s operational lifetime, it is anticipated that all structures above the seabed will be completely removed, with monopiles cut approximately 1 to 2 m below the seabed. The decommissioning sequence is expected to generally be the reverse of the construction sequence. Decommissioning industry best practice will be applied, considering the legislation applying at that time. Items to be decommissioned, as well as the methodology, will be agreed in due time with the relevant authorities and through revisions to this DP.

At the time of writing, some design details such as exact locations of infrastructure (e.g., due to micro-siting to avoid environmental and engineering constraints) are not finalised. Where unavailable the consented maximum parameters have been used. These details will be updated in future revisions of this DP. Further details of the decommissioning process, including the proposed decommissioning method for each of the major components (at this time) are set out in Section 4.

3.1 OFFSHORE TOPSIDE INFRASTRUCTURE AND FOUNDATION

The main components to be decommissioned are summarised in Table 3-1.

Table 3-1 Summary of topside infrastructure and foundations components to be decommissioned

Components	Number	Key dimensions
WTGs		
WTG	Up to 67	• Maximum tip height from LAT of 282 m • Maximum hub height from LAT of 175 m • Minimum clearance above sea level (MHWS) of 24 m
WTG foundations	Up to 67 monopiles	**Monopile** • Maximum bottom diameter 15 m. • Maximum length: 100 m. **Transition Piece** • Transition pieces will be mounted on the monopile during fabrication and will form the point of connection between the WTG to the monopile foundation. • Bolted connection with the Monopile with a grout seal.
OFSS		
Topside	One	• The maximum dimensions of the topside are; 70 m x 50 m (Length x Width(L x W) • Maximum height from LAT 50 m • Number of decks: 5
OFSS foundations	One jacket	• Type: Four legs, up to two pin piles per leg

3.2 CABLES

It is EAONL's preferred option methodology to bury the inter-array and export cables during installation, however there are instances in which additional cable protection may be required in order to achieve the intended depth of lowering requirement and/or protection of the asset. Cable crossings will also require cable protection to be placed on the seabed. At the time of writing, it is assumed that the cables and associated protection will be left *in situ* following decommissioning, with the exception of cable protection systems at foundations to enable the removal of the IACs from the WTGs and the OFSS. The main cable components to be decommissioned are summarised in Table 3-2.

Table 3-2 Summary of cables to be decommissioned

Components	Number	Key dimensions
IAC's	• 3-core 66 kilovolt (kV) armoured submarine cables • Copper or aluminium conductors • Insulation / conductor screening and steel wire armour with a further outer protective layer. • All cables will incorporate optical fibres for communication purposes. Further fibres may be required for condition monitoring and/or temperature measurement purposes.	Maximum length 200 km
Export Cable	• Two armoured submarine cables bundled together with a fibre optic cable.	Maximum length 152 km

4 DESCRIPTION OF PROPOSED DECOMMISSIONING MEASURES

4.1 INTRODUCTION

This section provides an overview of the decommissioning options available and sets out the proposed approach to the decommissioning of the various components of the Project as described in Section 3.

4.2 ADHERENCE TO RELEVANT LEGISLATION AND GUIDANCE

The proposed decommissioning measures set out in the following section aim to adhere to the following key UK and International legislation and guidance notes:

- Decommissioning of Offshore Renewable Energy Installations (OREIs) under the Energy Act 2004: Guidance notes for Industry (BEIS, 2019);
- Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, International Maritime Organisation (IMO), 19th October 1989;
- Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998, DECC;
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) guidance documents on offshore windfarms;
- Environmental Liability Directive;
- Guidelines for Environmental Risk Assessment and Management, Defra, September 2002; and
- United Nations Convention on the Law of the Sea (UNCLOS), 1982.

Other legislation of relevance includes the following:

- Hazardous Waste Regulations 2005;
- Coastal Protection Act 1949;
- Marine and Coastal Access Act 2009;
- The Water Resources Act 1991;
- Directive 2008/98/EC on waste (Waste Framework Directive);
- The Conservation of Habitats and Species Regulations 2010;
- The disposal or recovery of waste on land, principally under Part II of the Environmental Protection Act 1990, other legislation relating to the carriage and transfer of waste and, where appropriate, the Hazardous Waste Regulations 2005; and relevant health and safety legislation;
- London Convention 1972 and the 1996 Protocol, relating to the prevention of marine pollution by dumping of wastes;
- Construction (Design and Management) Regulations (CDM) 2007;
- The Conservation of Habitats and Species Regulations 2010 (as amended) which implements the EC Directive 92/43/EEC in the United Kingdom (if there is potential to disturb European Protected Species);
- Appropriate Health and Safety Regulations;
- MGN 654 and its annexes for OREIs - Guidance on UK Navigational Practice, Safety and Emergency Response; in particular Annex 4 which addresses risk mitigation for all phases of the project including decommissioning, and Annex 5 which addresses the SAR considerations;
- UK Marine Policy Statement;
- East Inshore/Offshore Marine Plans; and
- The Emergency Response and Co-operation Plan (ERCoP) (which will be developed before construction works start). A separate ERCoP will also be developed specifically for decommissioning prior to any decommissioning activities commencing.

In alignment with DESNZ guidance (BEIS, 2019), this DP will undergo comprehensive review 12-18 months before the first security provision to identify any changes in assumptions on cost and risk. From payment of the first security onward, EAONL will review the DP annually thereafter with any changes submitted to DESNZ for approval. Even if no changes are necessary, written confirmation stating a high-level review has been undertaken will still be submitted to DESNZ. A final review alongside any necessary updates will be conducted and submitted to DESNZ two years prior to the commencement of decommissioning, or sooner if deemed necessary by EAONL or DESNZ. The timing of the review ensures that the project is sufficiently close to the commencement of decommissioning for legislation and relevant guidance to be up to date at the point of

decommissioning. It also allows sufficient time for any necessary assessments to be undertaken or consents to be obtained. This DP will be updated following OFTO divestment.

The East Offshore Marine Plan (which reflects the requirements of the UK Marine Policy Statement) includes policies that apply to spatially discrete areas. One of these spatially discrete areas (E-AGG-3) overlaps with the EA ONE North ECC. The E-AGG-3 policy is intended to enable public authorities to consider how proposals for marine development and activities within areas of high potential aggregate resource, as defined by British Geological Survey, may impact the ability to access commercially viable marine sand and gravel resources in the future. At the time of decommissioning, consultation with relevant stakeholders will be undertaken in relation to Policy E-AGG-3 and this will be fully considered within the updated DP that will be produced two years prior to the end of the operational period of EA ONE North.

4.3 DECOMMISSIONING OPTIONS

EAONL have considered alternative options for the decommissioning of EA ONE North; with a brief summary of the options set out below. When making a final decision on the approach to decommissioning towards the end of the lifetime of EA ONE North, EAONL will take into consideration the Best Practicable Environmental Option (BPEO). This will include considerations of factors such as commercial viability, the prevailing regulatory requirements, practical feasibility, cost, environmental impacts and Health, Safety and Environment (HSE) risks.

4.3.1 Planned Phasing/Integration

EAONL will liaise with other offshore windfarm developers and / or OFTOs in the vicinity of the EA ONE North to identify and evaluate any potential opportunities for synergies or economies of scale through decommissioning facilities at the same time. If any opportunities are identified these will be discussed and agreed with the relevant authorities at the time of decommissioning and this document will be updated accordingly.

4.3.2 Decommissioning and Construction of a New Windfarm

Under this scenario, and subject to all necessary consents being granted, the existing windfarm would be decommissioned (either partially or in its' entirety) and a new windfarm erected. For this scenario, the assumption has been made that wind energy is still economically attractive at the end of the operational lifetime of EA ONE North, and the technical integrity of the windfarm is declining. If this were the case, installing new and better technology may be more profitable than increasing the Operation and Maintenance (O&M) effort on the existing windfarm should it be repowered.

4.3.3 Re-powering

In this scenario, it is assumed that wind energy is still economically attractive at the end of the operational lifetime of EA ONE North, the technical integrity of the wind turbines is declining, but the electrical infrastructure and possibly the foundations remain sound. If electrical infrastructure is installed properly, its lifetime could be up to 50 years. Experience from the oil and gas industry indicates that the lifetime of foundations can also be extended outside the original design specifications.

By closely monitoring the structural integrity of the asset, it could be possible, subject to any necessary consents being granted, to re-use these parts of the system in a repowering or life extension of the windfarm that is fitting new wind turbines to the existing foundation and electrical systems.

4.3.4 Step-down

This scenario assumes it is not profitable to invest in new technology but that most wind turbines will continue to perform sufficiently beyond the original design lifetime of 25 years. Under this scenario, the windfarm would be decommissioned through a controlled step-down. In this case, wind turbines would gradually shut down as their technical integrity declined. A decommissioning campaign would most likely be undertaken when the complete windfarm was shut down but could also be done stepwise if this were found to be more cost effective or if the prevailing regulatory regime required this approach. Any such step-down process would be set out for approval in the final DP.

4.4 GUIDING PRINCIPLES

In accordance with DESNZ guidance (BEIS, 2019), the choice of BPEO should be informed by an EIA. The EIA used to inform this DP is the one prepared in support of application for consent. The information relating to decommissioning in the ES will be reviewed to assess whether the final decommissioning methods and programme are substantially different from those detailed within this DP (for example, if the removal of marine growth before decommissioning is required or if the presence of invasive species on the structure is possible).

If necessary, more detailed assessment will be undertaken to accompany the application(s) for Marine Licence(s) (or appropriate consenting regime at the time of decommissioning) which will be required for decommissioning of EA ONE North.

In considering the final DP for EA ONE North, EAONL will seek solutions for each offshore element to align with the principles described in Table 4-1.

Table 4-1 Guiding principles

Guiding principles	Comments
No harm to people	EAONL is committed to adhering to the highest standards for health and safety throughout the lifecycle of the project. EAONL seek to promote safe practices and minimise risk in the development and implementation of decommissioning solutions.
Consider the rights and needs of legitimate users of the sea	EAONL respects the rights and needs of other users of the sea. Decommissioning activities will seek to minimise the impact on stakeholders and emphasis will be placed on clear, open communication.
Minimise environmental impact	The BPEO, at the time of considering the precise decommissioning procedure, will be chosen in order to minimise impact on the environment at an acceptable cost.
Promote sustainable development	In decommissioning, EAONL will seek to ensure that, as far as is reasonably practicable, future generations do not suffer from a diminished environment or from a compromised ability to make use of marine resources.
Adhere to the ‘Polluter Pays’ principle	EAONL 's decommissioning and waste management provisions acknowledge our responsibility to incur the costs associated with our impact on the environment.
Maximise re-use of materials	EAONL is committed to maximising the re-use of waste materials and pays full regard to the 'waste hierarchy'.
Ensure commercial viability	In order that commercial viability is maintained, the best available technique not entailing excessive cost decommissioning solutions will be sought.
Ensure practical integrity	Solutions that are necessary to achieve one or more of the above objectives must be practicable.

Considering the UK’s commitments under the UNCLOS; IMO standards and OSPAR, EAONL’s starting assumption in establishing the decommissioning requirements has been complete removal of all offshore components to shore for reuse, recycling or incineration with energy recovery or disposal at a licensed site. This assumption has been assessed for all components against the key principles presented above. In some instances, this option has not been considered appropriate and alternative options have been considered. These alternatives have also been assessed according to the above principles and the optimum solution selected.

Drawing on the DESNZ guidance (BEIS, 2019), in certain circumstances decommissioning can be deferred to a later date. However, DESNZ expect a robust case demonstrating definite re-use or justifiable reasons for deferring and any deferral will need to be approved by the Secretary of State. Amongst the factors to be taken into account in considering the case for deferral will be the condition of the installation, the presence of any hazards, the environmental impact and the impact on other users of the sea.

It is possible that, in future, certain projects may be repowered (subject to the necessary regulatory consents). DESNZ will consider any amendment of DPs as a result of a proposed repowering on a case-by-case basis. DESNZ requires early engagement before decommissioning can be deferred, or repowering can be actioned.

The DESNZ guidance (BEIS, 2019) also notes there are some cases where it may be possible to consider solutions other than complete removal.

"If making arguments for exceptions to full decommissioning, developers/owners should take the following points into account:

- *Arguments should be tailored to the individual site and should set out whether the risks of buried cables etc are equal across all parts of the site (for example, are some areas of the site more prone to sediment shift?);*
- *Arguments should be relative to the effect of conducting the activity during construction;*
- *The IMO exception for 'extreme cost' is not normally expected to be accepted where it is the sole reason being cited for partial decommissioning;*
- *Where safety concerns are being cited, this is likely to be given greater weight if written evidence from a third party (such as the Health and Safety Executive or a known decommissioning contractor) can be provided; and*
- *The developer/owner is encouraged to consider using the 'Comparative Assessment Framework' set out in decommissioning guidance for the Oil and Gas sector when determining and setting out their position.*

Where less than full decommissioning is proposed, developers/owners will need to engage with other regulators (such as the Marine Management Organisation and Natural Resources Wales in respect of Marine Licences and Maritime and Coastguard Agency and the General Lighthouse Authority in connection with navigational risk) and their landlord on the acceptability of the proposals."

4.5 Proposed Decommissioning Measures

This section identifies parts of EA ONE North where EAONL propose that the infrastructure will be removed or be left *in situ*. A summary of the proposed decommissioning measures for the offshore components of EA ONE North are outlined in Table 4-2.

Table 4-2 Summary of proposed decommissioning measures for EA ONE North

Component	Proposed decommissioning measures
Wind Turbines	Complete removal from site and recycle where possible at a suitable onshore facility preferably in the UK. In addition, potential reuse opportunities may be explored.
Monopiles	Complete removal of the transition pieces. Removal of monopile cut at a depth of approximately 1 to 2 m below the seabed.
Offshore Substation	Complete removal of topside and jacket from site. Cutting of pin piles approximately 1 to 2 m below the seabed. The top length of the cut section of the pin piles will then be recovered, leaving the length of pin pile below the cut line remaining in the seabed.
Scour Protection	Left *in situ*.
Inter-array Cables	If the IAC is buried it will be left *in situ* and only the ends of the cables including Cable Protection System (CPS) will be removed where they cross the scour protection. Cable cut ends beyond the scour protection will be left at the required Depth Of Lowering (DOL).
Export Cables and Cable Protection	If the export cabling is buried it will be left *in situ* and only the ends of the cables including CPS will be removed where they cross the scour protection. Cable cut ends beyond the scour protection will be left at the required DOL.

It is noted that future revisions of the DP will consider new technologies as appropriate. If proposed methodologies are changed in subsequent revisions, consultation with stakeholders and regulators will be summarised and included.

In addition, it is assumed a number of ports will have been established on the east coast of the UK which are capable of decommissioning the large volume of material from monopiles, transition pieces and wind turbine generators. At present this does not exist, and the only potentially suitable ports would be located in the northeast of England namely in the Teeside and Tyneside regions.

Where considered necessary, post-decommissioning monitoring surveys of the seabed will be carried out following the completion of the decommissioning works. The requirement for monitoring and the extent and approach taken will be determined based on the scale of the remaining infrastructure, the risk of exposure and the risk to other marine users is further discussed in Section 2.2.3.2 of this DP.

4.5.1 Wind Turbine Generators

4.5.1.1 Wind Turbine Components

Decommissioning of the wind turbine components is expected largely to be a reversal of the installation process, including blades, nacelle, and tower, and subsequently subject to the same constraints. Using today's technologies, dismantling of the turbines would require a jack-up vessel to ensure adequate control and to cope with the relatively high lifts and crane hook loads. Even though decommissioning may not require the same level of precision and care as during installation, it would be undertaken in the same controlled manner and in accordance with a risk management plan to ensure the same level of safety and pollution control measures.

The first phase of decommissioning would be to prepare the site, which would typically include the following:

- De-energise and isolate required electrical control and power cables from the grid;
- Removal of all loose items from the structures;
- Removal of liquids such as lube oils / transformer liquids etc.;
- Installation/certification of lifting points;
- Hot bolting key bolts to aid unbolting process; and,
- Cutting and securing of cabling crossing from nacelle to the tower and tower to the Transition Piece.

Once the preparation has been completed, the turbine structures would be removed. It is expected that structures would be removed by crane, with actual procedures being dictated according to capacities of the available plant. An example of the procedures that may be employed is described below:

- Attach blade lifting tool to crane hook;
- Removal of the three individual turbine blades from the blade hub and place on the deck of the vessel;
- Attach nacelle lifting tool to main crane hook;
- Disconnection of nacelle from tower and lift to the deck of vessel;
- Attached tower lifting tool to main crane hook;
- Unbolt tower at transition piece and remove to a jack-up vessel;
- Sea fasten all decommissioned WTG components to the deck of the jack-up vessel;
- Remove all components to an appropriate handling facility onshore. Components may be reused as a whole however it is likely they will be disassembled to parts and sizes suitable for reuse, recycling or disposal as follows;
    - All hazardous substances and fluids from the turbines (e.g. oil reservoirs and hazardous substances) to be disposed of in accordance with relevant regulations at the time of decommissioning;
    - All steel components will be processed for reuse, where feasible, or sold for scrap to be recycled. This forms the bulk of the structures and substructures; and
    - The fibreglass turbine blades to be recycled where possible.

4.5.1.2 Monopiles

Following the separation of the WTG from the monopile the transition piece will be cut from the monopile and will be removed. Current technology does not allow the full length of a pile to be removed from the seabed.

The monopile will then be cut to remove at approximately 1-2 m below the seabed. In order to access the monopile cutting point some jetting and suction of sediment as well as some shifting and movement of the scour protection may be required. In addition, the level the monopile is cut below the seabed will be determined using sandwave migration observed during the operational lifetime of the windfarm and balanced against the disruption/feasibility of removing more than 1-2 m.

At the time of writing, it is expected that monopiles will be cut with a high velocity stream of water using abrasive materials to cut the monopile at the required depth. However, it is recognised that at the time of decommissioning there may be improved technologies available for consideration. Once cut; the top section of the monopile will then be lifted onto a vessel. Monopiles and transition pieces will be transported to port for

dismantling and reuse and recycling where possible. The remaining section of the monopile below the cut line will be left in the seabed.

4.5.2 Offshore Substation

The decommissioning of the OFSS will follow a similar method as described for the wind turbines and turbine foundations. It is expected that the offshore substation would be decommissioned in two main stages, comprising the complete removal firstly of the topside, followed by removal of the jacket foundation.

4.5.2.1 Topside and Jacket

Prior to removal of the topside, a number of preparatory activities would be conducted including the following:

- De-energise and isolate required electrical control and power cables from National Grid and Supervisory Control and Data Acquisition (SCADA) system;
- Dismantle terminations for export and array cables;
- Inter array and export cables would be cut at the cable deck area to allow the topside to be lifted freely. Ends of cables going to the J-Tubes would be secured to the cable deck for subsequent recovery with the jacket after the cables have been cut at the subsea J-Tube entry point. Removal of all unsecured loose items from the topside;
- Containment and/or removal of potentially hazardous/polluting fluids. A special agreement will be made with the Gas Insulated Switchgear supplier to ensure the safe removal of the SF6 Gas; and
- Cutting welded stab-in connections between topside and foundation.

Once this is complete, the topside would be lifted onto a barge for removal from the site. It is expected that the topside would be transported to shore where it would be dismantled, with electrical equipment and oil from transformers being removed and parts processed for reuseor recycling as feasible.

Once the topside is removed, the jacket foundation would be decommissioned by cutting the legs of the jacket structure just above the piles, and removal by crane. This would be achieved either through excavation outside and inside of piles to approximately 0.5 m below anticipated level of cutting (including removal of scour protection or debris around the base of the foundation). The jacket would then be lifted on to a vessel and transported to shore for reuse, recycling.

4.5.2.2 Pin-pile Foundations

The proposed approach to the decommissioning of the OFSS pin pile foundations is to cut off the piles at a depth of approximately 1 to 2 m below seabed level. The piles would be removed by cutting at an appropriate depth, such that any part of the pile remaining in the ground would be likely to be covered by seabed sediment. The target for cutting is a minimum of 1 m below the seabed, although this is likely to vary due to individual localised factors such as ground conditions at each site. Currently, abrasive diamond wire cutting is considered likely to be the preferred method for the cutting of the pin pile foundations, but other methods may be preferred at the time of decommissioning. The material cut off from the pin piles would be recovered and taken ashore for scrap recycling.

The actual method of cutting will be agreed with the authorities after consultation and feasibility studies have been undertaken and the methodology will seek to be least damaging to the surrounding seabed and the most environmentally acceptable using best available techniques at the time. the use of divers for any removal works will be minimised and if possible, avoided completely. If required, blasting by the use of shaped charges may be employed. Explosive cutting is a well-known method, but it is not expected to be the first choice.

After removal of the cut pile sections, it is anticipated that excavations at the pile leg locations would refill naturally over time.

Removal of foundations may therefore follow the outline process below:

- Excavation to approximately 1 m below the required cutting depth. Excavated sand and silt will be disposed of to the seabed adjacent to the pile. Consideration of the presence of scour protection will also be made with respect to excavation of foundations;
- The foundation will be rigged up onto the decommissioning vessel crane;
- Cutting off of the pile at an appropriate depth;

- The foundation will be lifted out of the water onto a vessel's deck, if necessary, cutting into sections to allow this; and
- Batches of recovered foundations will be transported to shore for recycling.

There is potential that a vibrohammer could be used to facilitate lifting of the pin piles out of the ground. In this instance, the pin piles would not require to be cut. The vibrohammer would lift the pin piles out of the ground in one piece prior to removal of the jacket. It must be noted that the use of a vibrohammer for pin pile removal in the offshore wind industry is still a developing technology. So potential use will be revisited closer to the time of decommissioning. As mentioned above in Section 4.5.1.2, current technology does not allow the full length of a pile to be removed from the seabed. The level at which the piles will be cut below the seabed will be determined using sandwave migration observed during the operational lifetime of the windfarm and balanced against the disruption/feasibility.

4.5.3 Scour Protection

Scour protection materials, as installed for duration of operations and maintenance, will not be removed during decommissioning. By their nature, these materials would be difficult to recover due to being within the marine environment for 25 or more years. This would make attaching and lifting scour protection materials challenging and reducing the project to crude grab methods which could result in significant disturbance to be seabed. In addition, it may be determined that the materials provide useful marine habitat as artificial reefs by the time of decommissioning.

Relevant stakeholders and regulators will be consulted to establish what the best approach is. If removal is deemed necessary, removal of the rock material will be considered alongside available technologies at the time. The rock material would then be transferred to a suitable barge for transport to an approved onshore site for appropriate disposal or re-use.

Consultation on the decommissioning approach for scour protection material will be undertaken prior to decommissioning with all relevant stakeholders including the fishing industry, who will be consulted by means of the commercial fisheries working group.

4.5.4 Inter-array Cables

At the end of the operational life of the windfarm, cables may be buried up to 7 m deep in places, depending on their original burial depth and whether sandwaves have moved over them. It is currently anticipated that the removal of the IAC would have a greater impact on the environment than leaving the decommissioned cables buried in the seabed. If the cable length is expected to remain covered and total cable removal is therefore not required, reburying of cut cable ends is likely to be carried out by Remotely Operated Vehicles (ROV) or Mass Flow Excavator (MFE). The method of burial and any monitoring required will be subject to consultation with relevant stakeholders and regulatory bodies prior to the commencement of decommissioning activities. Thus, the intention would be to only remove sections of IAC, or cable ends which are exposed. Any cable removal will only be the cable ends within the CPS.

The following process is likely to be employed for the decommissioning of the IAC:

- Buried sections of IAC will be left *in situ*;
- Cable ends at foundations and OFSS will be cut, then exposed ends buried;
- Sections of IAC found to be at risk of exposure or otherwise causing a hazard will be cut and exposed ends buried; and,
- Cut sections will be recovered and sent ashore for disposal.

If full removal is required, cables will be 'peeled' out of the seabed recovering to a vessel carousel and assisted where required with an MFE where cable tensions are too high for efficient cable peel out. All recovered cabling will be discharged ashore for disposal.

4.5.5 Export Cables

Relevant stakeholders and regulators will be consulted to determine which sections of the export cables will need to be removed at the relevant time. If there are no issues raised by stakeholders/regulators and the risk of the export cables becoming exposed is considered to be minimal, then it is likely that the export cables will be left *in situ*. The ends of the cables will be cut as close to the OFSS foundation as possible either prior to foundation removal, or at the same time. Cable ends will be buried, likely by MFE or ROV, to ensure they do

not represent a hazard to fishing, shipping etc. Further details will be included in the Cable Specification and Installation Plan as required to be submitted for approval to the MMO under the dMLs conditions.

At cable or pipeline crossings, where the export cable is crossing the other third party on top, the export cables will be removed. It is likely that EAONL install concrete mattresses as a separation medium between the crossed assets during construction. In the case of export cable removal, these mattresses will be removed during decommissioning. Removal of cable mattresses will utilise a mattress subsea recovery tool for the removal of mattresses. The mattress will be lifted from the seabed and recovered to vessel deck to be recycled or disposed of ashore.

In the case the export cable is being crossed by another third-party asset, then the export cable will be cut at an agreed distance from the crossing and left *in situ*. Due to third-party agreements, EA ONE North are required to ensure assets remain protected throughout and following decommissioning of the Project. In the case of EA ONE North cable removal, cables will be cut either side of the cable protection and removed leaving the remainder of the cable underneath the protection which will be left *in-situ.* In doing so, the EA ONE North and the third-party cables mattress protection will remain in place to reduce potential risk of damaging assets. Burial of the ends may be undertaken by MFE, ROV or a trencher to be confirmed within the DP reissue prior to decommissioning.

Rock at crossings will be left *in situ* irrespective of the crossing design (i.e. the export cables crossing assets or being crossed by third party assets).

In the event that removal of export cables is required, the following process is likely to be employed:

- Survey to identify the location of the export cables that need to be removed;
- Buried export cables will be recovered using a detrenching grapnel train to recover them from the seabed at the initial lifting location. Alternatively, or in addition, it may be necessary to use a ROV mobilised with a cut and grab cable recovery tool to initiate the cable recovery process so that the cable can begin to be recovered by peel out of the seabed by the recovery vessel;
- Seabed material may need to be displaced to locate the cable for recovery by ROV cut and grab tooling. This is likely to be carried out using an MFE deployed from the cable recovery vessel;
- The recovery vessel will either spool the recovered cable into a carousel or cut it into lengths as it is brought onboard before transport to shore; and
- Recovered export cables will be processed for reuse where feasible or stripped and recycled at appropriate onshore recycling facilities.

Materials and volumes of cable protection that will be installed for operations has not been defined at this time. Any removal of cable protection will be in alignment with legislation and guidance at the time of decommissioning and will be informed by surveys.

4.6 Proposed Waste Management Solutions

The scale of the offshore wind turbines means that a large amount of material would need to be managed once the structures are decommissioned. EAONL is committed to maximising the re-use of waste materials and will give full regard to the 'waste hierarchy' which suggests that reuse should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal. In any event, waste management will be carried out in accordance with all relevant legislation and with any necessary disposal taking place at appropriately licensed onshore facilities.

The proposed approach to end of life management of the main components of EA ONE North is set out in Table 4-3 but is subject to evolution of technology, change in regulations and demand for materials over the lifetime of EA ONE North.

Table 4-3 Proposed waste management approach

Waste material	Pre-treatment	Approach
Wind turbine monopiles	Establish available design life at end of 25 years	Reuse by repowering with new/superior wind turbines, other renewable generation technology or dismantle and reuse, alternatively, the recovered material as much as possible

Waste material	Pre-treatment	Approach
Steel from wind turbine tower and nacelle removed to shore	Break down into transportable sizes	Reuse or recycle
Copper from power cables and transformers	Strip cable from power cables and transformers	Reuse or recycle as permitted by legislation, policy and available technologies at the time of decommissioning.
Wind turbine blades	Physical processing (e.g. cutting, stripping and/or shredding)	Reuse or recycle as permitted by available technologies at the time.

The port(s) associated with the decommissioning are not known at the time of writing however these will be confirmed and appropriately assessed prior to decommissioning. The final details of the DP and waste arrangements will be confirmed prior to decommissioning to accommodate changes in legislation, guidance and technology. As part of this process, appropriate waste management regulations and guidelines will be reviewed. A Waste Management Plan (WMP) will be prepared in advance of the commencement of decommissioning to ensure that adequate time is allowed for the necessary provisions to be made with regards to waste management.

4.7 Lighting and Marking

In accordance with the requirements of the EA ONE North DCO and dMLs, the appropriate marks and lights, sounds, signals, and other aids to navigation shall be exhibited during the decommissioning of EA ONE North.

In relation to aviation safety, the shape, colour, and character of the lighting will be compliant with the Air Navigation Order 2009 (or then current regulation or as otherwise directed by the Civil Aviation Authority).

In relation to navigational safety, lights and markings will be discussed with the Trinity House, in consultation with the Maritime and Coastguard Agency (MCA). Trinity House will be consulted at least 6 months prior to decommissioning to specify any obstruction marking that may be required during the removal operations. If any obstruction is left on site that may be considered to present a hazard to navigation the necessary marking specified by Trinity House shall be displayed.

An Aids to Navigation (AtoN) Management Plan will be produced for the lifecycle of the Project. The AToN Management Plan will represent the formal submission to the MMO to discharge Schedule 13 Condition 17 (1)(i) and Schedule 14, Condition 13 (1)(i) relating to the requirement for the submission (and subsequent approval by the MMO) of an AtoN Management Plan. This plan is still subject to final approval by the MMO.

5 ENVIRONMENTAL IMPACT ASSESSMENT

In support of the application for Development Consent, EAONL prepared an EIA for EA ONE North as reported in the ES. In compliance with the EIA Directive, a lifecycle approach was taken in assessing the impacts of EA ONE North on the receiving environment and subsequently seeking to mitigate and minimise the effects of the development. In all instances a 'worse case' Rochdale Envelope approach was taken to the assessment. The assessment of the impacts included the process of decommissioning. Table 5-1 summarises the predicted impacts resulting from the decommissioning phase.

Table 5-1 Predicted impacts of the decommissioning phase

Environmental topic	Assessment conclusions
Fish and Shellfish Ecology	Note that the sensitivity of receptors during the decommissioning is assumed to be the same as given for the construction phase. The magnitude of effect is considered to be no greater and, in all probability, less than that considered for the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than those assessed for the construction phase (outlined below): • Physical disturbance and temporary loss of seabed habitat– Minor Adverse residual impact • Increased suspended sediment and sediment re-deposition – Minor Adverse residual impact • Re-mobilisation of contaminated sediment during intrusive works – Negligible residual impact

Environmental topic	Assessment conclusions
	• Underwater noise impacts to hearing sensitive species – Minor Adverse residual impact • Changes in fishing activity – Minor beneficial impact
Marine Mammals	Note that the sensitivity of receptors during the decommissioning is assumed to be the same as given for the construction phase. The magnitude of effect is considered to be no greater and, in all probability, less than that considered for the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than those assessed for the construction phase (outlined below): • Underwater noise from foundation removal (e.g. cutting) - Negligible – Minor Adverse residual impact • Behavioural impacts resulting from the noise associated with foundation removal (e.g. cutting) – Negligible – Minor Adverse residual impact • Underwater noise and disturbance from vessels – Minor Adverse residual impact • Barrier effects as a result of underwater noise associated with noisy activities – Minor Adverse residual impact • Vessel interaction (collision risk) – Negligible – Minor Adverse residual impact • Changes to prey resource – Negligible – Minor Adverse residual impact
Offshore Ornithology	Note that the sensitivity of receptors during the decommissioning is assumed to be the same as given for the construction phase. The magnitude of effect is considered to be no greater and, in all probability, less than that considered for the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than those assessed for the construction phase (outlined below): • Direct disturbance and displacement – Negligible to minor adverse residual impact • Indirect effects due to prey species displacement – Negligible to minor adverse residual impacts
Commercial Fisheries	As decommissioning schedules and methodologies are not available, decommissioning works and implications for commercial fisheries are considered analogous with those assessed for construction (outlined below): • Potential impacts in commercially exploited fish and shellfish – Minor Adverse residual impact • Temporary loss or restricted access to traditional fishing grounds – Negligible to Minor Adverse residual impact • Displacement of fishing activity into other areas – Negligible to Minor Adverse residual impact • Increased steaming times – Minor Adverse residual impacts for local inshore fleets and Negligible residual impact for all other fleets • Interference with fishing activity – Minor adverse residual impact • Safety issues for fishing vessels - within acceptable limits • Seabed obstacles – within acceptable limits
Shipping and Navigation	• Commercial vessel rerouting – No perceptible effect • Commercial vessel safe navigation – No perceptible effect • Marine aggregate dredgers – No perceptible effect • Commercial fishing vessels – No perceptible effect • Recreational craft – No perceptible effect • Emergency response capability – Broadly acceptable
Marine Archaeological and Cultural Heritage	• Direct impact to known heritage assets – no impact • Direct impact to potential heritage assets – Minor adverse residual impact • Indirect impact to heritage assets from changes to physical processes – no impact • Impacts to the setting of heritage assets and historic seascape character – Perceptions of historic character will remain unchanged or will result in a potential beneficial change. In terms of setting, it has been concluded that any changes to

Environmental topic	Assessment conclusions
	setting due to decommissioning activities would be temporary and of sufficiently short duration that they would not give rise to material harm.
Marine Geology, Oceanography and Physical Processes	No significant impacts identified.
Marine Water and Sediment Quality	• Deterioration in water quality due to increased SSCs during removal of accessible installed components – Negligible to Minor Adverse residual impacts
Benthic Ecology	• Sites of Marine Conservation Importance – Negligible. • Loss of habitats and species colonising hard structures – Minor Adverse residual impacts • Loss of habitat resulting from foundation or cable infrastructure not being fully removed during decommissioning – Minor Adverse residual impact •
Infrastructure and Other Users	• Impacts on sub-sea cables – No change residual impact • Impacts on EDF energy infrastructure – No change residual impact
Seascape, landscape and visual amenity	No significant impacts identified.
Tourism, recreation and socioeconomics	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. As such, for the purposes of a worst-case scenario, impacts no greater than those identified for the construction phase are expected for the decommissioning phase • Offshore construction employment – Moderate beneficial impact • Tourism employment -Major beneficial impact • Tourist and recreation disturbance – Negligible residual impact
Civil Aviation	No significant impacts identified.

The final details of the DP will be confirmed prior to decommissioning activities taking place, the information relating to decommissioning in the ES will undergo a comprehensive review to assess whether the potential impacts that may arise are covered in the initial EIA, in line with the DESNZ guidance (BEIS, 2019). At this point, a decision will be made as to whether a more detailed assessment it required. Key criteria that will inform this decision include:

- The understanding of the baseline environment at the time just prior to decommissioning, informed by the findings of the environmental monitoring of the development and engineering/ asset surveys such as cable burial monitoring;
- A review of any relevant new or updated legislation, policy or guidance;
- A review of other marine use (fishing, navigation etc.) with potential to be affected by decommissioning;
- Amenities, the activities of communities and on future uses of the environment; and
- Historic environment interests.

It is also noted that the EA ONE North development have compensation obligations, such as artificial nest structures and predator control fencing. The DCO states that these 'must not be decommissioned without written approval of the SoS, in consultation with the relevant statutory nature conservation body. These compensation measures shall be maintained beyond the operational lifetime of the authorised development if they are colonised by relevant species, and routine and adaptive management and monitoring must continue whilst the compensation measures are in place. EA ONE North compensation requirements will also be considered as part of the environmental review process.

If required, a specific EIA covering the decommissioning process will be prepared, which will fill in any gaps in relation to the above. Furthermore, it will describe the measures envisaged to avoid and reduce, and if possible, remedy any significant adverse impacts during decommissioning. This comprehensive review will be undertaken in line with the timescales outlined in the DESNZ guidance.

6 CONSULTATION

6.1 INTRODUCTION

EAONL regards effective and open communication and consultation as essential elements to the successful development of EA ONE North. These principles have been adopted during the development of the project and will be applied during the life of EA ONE North, including the decommissioning phase of the project.

6.2 REQUIREMENTS

As detailed under the EA ONE North Section 105(2) notice, EAONL are required to carry out consultation specified in the notice before submitting a DP for approval. The Section 105 notice sets out the following bodies:

- Marine Management Organisation;
- Natural England;
- Chamber of Shipping;
- Maritime and Coastguard Agency;
- Royal Yachting Association;
- Trinity House;
- National Federation of Fishermen's Organisation;
- Conservation Agency;
- Relevant Harbour Authorities (Port of Lowestoft and Great Yarmouth Port Authority);
- Relevant Inshore Fisheries;
- Environment Agency; and
- British Marine Aggregate Producers Association (BMAPA).

In addition, and in accordance with the DESNZ guidance (BEIS, 2029), other interested parties such as Historic England, UKHO, JNCC, The Crown Estate and Third-party Asset owners will also be consulted upon.

6.3 ONGOING CONSULTATION AND NOTIFICATIONS

Consultee bodies listed in the Section 105 notice and any other stakeholders who become relevant prior to decommissioning will be provided with the opportunity to comment on the final decommissioning strategy prior to it being finalised. The list of consultees will reflect changes in patterns of activity over the lifetime of the windfarm. Feedback from stakeholder consultation and associated amendments to the DP will be included within subsequent revisions of the DP to provide sufficient confidence that stakeholders concerns have been addressed. This will also be included within a Decommissioning Programme Consultation Report and will include detail of consultee, date of consultation, comment and location of amendment within the accompanying DP.

At the time of decommissioning, and in accordance with relevant clauses of the EA ONE North DCO and dMLs, EAONL will issue timely and efficient Notices to Mariners (NtM) and other navigational warnings of the position and nature of the decommissioning activities taking place. Efforts will be made to ensure that this information reaches mariners in the shipping and fishing industry as well as recreational mariners. The UK Hydrographic Office will be notified as appropriate on the progress and completion of the works. Trinity House will be consulted at least 6 months prior to decommissioning.

EA ONE North is committed to ongoing consultation with the fishing industry including the appointment of a Fisheries Liaison Officer who will be employed throughout the lifetime of the project and through the commercial fisheries working group who will consult the relevant stakeholders on decommissioning activities.

7 COSTS AND FINANCIAL SECURITIES

A detailed cost estimate for decommissioning works will be developed and will be submitted for approval by DESNZ alongside information relating to the financial security provision required under the Energy Act 2004 and in line with the requirements set out in the DESNZ guidance (BEIS, 2019). An accompanying document

providing a breakdown of estimated decommissioning costs by category will be provided alongside submission of this DP to DESNZ.

8 PROPOSED DECOMMISSIONING SCHEDULE

A full decommissioning schedule will be provided a minimum of three years prior to decommissioning setting out the detailed programme of the proposed decommissioning works for consultation with the relevant authorities and approval by SoS.

At this stage, it is proposed that decommissioning would commence at year 25 after final commissioning of EA ONE North, coinciding with the end of the design life of the wind turbines (but noting the options set out in Section 0). A review of the DP will commence at year 23, two years prior to the expected start date of the decommissioning operations. At this point, the possibility of repowering the site (i.e., removing and replacing the turbine topsides and possibly other transmission equipment) could extend the life of the windfarm for an additional period of approximately 25 years.

This review will include the review of cumulative EIA to determine changes to the assessed baseline, to reflect the baseline and criteria of mitigation at the time of decommissioning.

It is proposed that the full decommissioning of EA ONE North will be of similar or less duration than the construction phase. Offshore decommissioning and onshore dismantling of the decommissioned infrastructure would run in parallel.

9 PROJECT MANAGEMENT AND VERIFICATIONS

Once EA ONE North is nearing the end of its agreed operational life (25 – 50 years depending on repowering), EAONL will initiate a final review of the DP and finalise the detail of the decommissioning provisions. This will include project management arrangements, the schedule, costs, and the verification processes to ensure decommissioning is completed. It is anticipated that the development of the final DP will occur in approximately year 23 (or year 48 depending on repowering) after final commissioning of EA ONE North.

Following decommissioning works, it is anticipated that a Decommissioning Report will be submitted to the appropriate regulatory authorities. In accordance with the DESNZ guidance (BEIS, 2019) the decommissioning report will include:

- Evidence (e.g., photographic evidence of infrastructure out of the water, or survey footage of the seabed) that all infrastructure that was due to be removed according to the DP, has been removed;
- Independent verification that decommissioning took place in accordance with the approved DP and the assessed impacts on the environment. Should there be any variations from the approved DP, a statement will be provided with reasoning;
- Any surveys which may be required to enable the identification and subsequent recovery of any debris located on the seabed which may have arisen from the owner's/developer's activities, and which may pose a risk to navigation, other users of the sea or the marine environment. These should cover the site and an appropriate buffer zone to allow a comparison with the environment prior to construction;
- A compliance statement setting out how relevant regulations (environment, health and safety) have been complied with together with any instances of non-compliance);
- A cost breakdown to enable DESNZ to understand the actual cost of decommissioning compared to the predicted cost and to gain a better understanding of the potential accuracy of new DPs; and
- If infrastructure is left *in situ,* evidence that it has been cut off, buried, or otherwise made safe and treated in accordance with the DP.

10 SEABED LEFT AS INTENDED

In line with the details provided above, EAONL is committed to covering the costs required to decommission EA ONE North and ensuring the seabed has been cleared as agreed with the authorities. The construction and operation of EA ONE North will be in accordance with the MMO's dropped object procedure, however where necessary, upon completion of the decommissioning works, a survey will be undertaken to ensure that all project debris which has been identified for removal has been removed. The survey will enable identification

and recovery of any debris located on the seabed which may have arisen from activities related to the decommissioning process and which may pose a risk to navigation or fishing gear. The process of collecting and presenting evidence that the site is cleared is required to be independent of EAONL. EAONL proposes that an independent survey company complete the surveys and that they report in parallel to both EAONL and DESNZ. The results of these surveys will be issued to DESNZ for review and comment.

The required survey area would be determined during the decommissioning phase of the project, considering good practice at the time and the views of stakeholders. It is anticipated that the survey area would focus on the renewable energy installations (i.e., the jacket substructure and monopile locations), as it is assumed that inter-array and export cables will be left *in situ*. EAONL is aware of the current 500 m survey radius around any oil and gas installation as set out in best practice guidance for post-decommissioning surveys. However, due to the smaller footprint of the EA ONE North installations, EAONL proposes a smaller radius could be used, for example, 100 m (based on the area within which decommissioning of each structure would occur and within which jack up vessels would operate). This will be agreed with relevant regulators and statutory advisors prior to decommissioning.

Consideration will also be afforded to the most up to date list of Archaeological Exclusion Zones (AEZs) described in the EA ONE North WSI (EA1N-CST-CNS-COM-IBR-000001) and *S. spinulosa* buffer areas in order that these are not inadvertently affected in the process of removing any potential windfarm debris. Analysis of any survey data gathered will also ensure that items for removal and disposal relate only to EA ONE North. Consultation with relevant stakeholders will be conducted in the event that other anomalies of archaeological interest are identified during seabed clearance. In addition, EATL will implement the broader terms of the EA ONE North WSI (EA1N-CST-CNS-COM-IBR-000001).

11 RESTORATION OF THE SITE

EAONL is committed to restoring the site of EA ONE North and the ECC as far as is reasonably practicable and in the manner agreed with the relevant authorities and stakeholders. Consistent with the decommissioning provisions detailed above, the key restoration work will relate to:

- Ensuring that foundations are cut below the level of the surrounding seabed and are made safe and adequately covered; and
- Ensuring that cable ends are adequately buried or otherwise protected.

It is anticipated that following the decommissioning of WTG and the OFSS components, indentations will be left in the seabed. It is anticipated that these indentations will back-filled naturally.

In addition, EA ONE North confirms scour protection materials will not be removed during decommissioning. By their nature these materials would be difficult to recover and, in any case, may provide useful marine habitat as artificial reefs by the time of decommissioning. Active restoration by mechanical excavation is not considered to be appropriate, as it would pose an unnecessary risk to personnel and the environment. Allowing the seabed to ‘self-settle’ is considered sufficient and in proportion to the limited environmental impact of the proposed decommissioning process. This latter approach is also proposed with respect to the in-filling of any scour pits left after the main decommissioning works. Any scour pits that form in this area will have been produced due to the presence of the pile structures acting on local hydrodynamic processes. Upon removal of these structures, it is predicted that these scour pits will start to infill naturally.

Further details on how the site will be restored will be provided in the updated DP towards the end of the project’s life.

12 POST-DECOMMISSIONING MONITORING, MAINTENANCE AND MANAGEMENT

Given that EAONL are not proposing to fully remove the entire EA ONE North infrastructure, some post-decommissioning activities may be required to identify and mitigate any unexpected risks to commercial fishing, navigation or other users of the sea. For example, this could be because of foundation piles or cables becoming exposed through natural sediment movement. The requirement for monitoring, timing, the extent and approach taken will be determined based on the scale of the remaining infrastructure, the risk of exposure and the risk to other marine users. EAONL is committed to ongoing consultation with the fishing industry including the appointment of a Fisheries Liaison Officer who will be employed throughout the lifetime of the project and through the commercial fisheries working group who will consult the relevant stakeholders on decommissioning activities.

EAOWL will commit to the minimum number of surveys as required by the DESNZ guidance. Consultation with relevant stakeholders will be undertaken to determine if post-decommissioning monitoring surveys will be required following the completion of the decommissioning works, and appropriate timescales to carry them out. At the time of writing, it is assumed that monitoring surveys will be required at defined intervals following decommissioning which will be agreed with the relevant stakeholders prior to decommissioning. The surveys are expected to comprise geophysical surveys (such as swath bathymetry, side scan sonar and magnetometer) and will be carried out according to the applicable and relevant guidance and standards at the time of decommissioning. Consultation will also be undertaken with the MMO and appropriate stakeholders prior to these surveys to ensure the appropriate licences and permits are in place. The results of these surveys will be issued to DESNZ for review and comment.

If an obstruction appears above the level of the surrounding seabed following decommissioning which is attributable to EA ONE North, it will be appropriately marked so as not to present a hazard to other sea users. The navigational marking will remain in place until such time as the obstruction is removed or no longer considered a hazard. The monitoring of the obstruction will be built into any monitoring and maintenance programme.

Details of the post-decommissioning monitoring, maintenance and management will be discussed with stakeholders closer to the point of decommissioning. For clarification, post-decommissioning monitoring, maintenance and management will be the responsibility of the asset owner at that time.

13 REFERENCES

ScottishPower Renewables. (2019) East Anglia ONE North Offshore Windfarm Volume 1 Environmental Statement

East Anglia Offshore Wind. (2012). East Anglia Offshore Wind Zonal Environmental Appraisal Report, March 2012.

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Oil and Gas Authority. (2018) Interactive maps and tools. Available at https://www.ogauthority.co.uk/data-centre/interactive-maps-and-tools/

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