European Offshore Wind Deployment Centre

Decommissioning Programme

ABE-ENV-BG-0011

August 2017

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STATUS	**DATE**	**REVISION**	**NAME**	**SIGNATURE**

Revision	Date	Revision changes
0	23/08/2017	First issue

Draft Decommissioning Programme Overview

Purpose and Objectives of the Plan

This Decommissioning Programme (DP) has been prepared to address the specific requirements of the relevant condition attached to the Section 36 Consent (S.36) issued to Aberdeen Offshore Wind Farm Limited (AOWFL) and the requirements of the Energy Act 2004.

The overall aim of this DP is to set out, for informal consultation, the procedures for the decommissioning phase of the Development and in line with the relevant guidance.

This DP confirms that the decommissioning process aligns with that considered in the original Application, and that decommissioning related mitigation measures detailed in the Application will be applied during decommissioning.

Scope of the Plan

This DP covers:

-Components to be decommissioned;

-Decommissioning options;

-The proposed decommissioning process;

-Waste management solutions;

-Lighting and marking;

-Costs and financial security;

-Decommissioning schedule;

-Project management and verification;

-Seabed clearance;

-Site restoration; and

-Post-decommissioning monitoring, maintenance and management.

Structure of the Plan

This DP is structured as follows (and in line with the requirements of the relevant guidance):

Section 1 provides an overview of the development, relevant consent conditions and an outline of the document structure.

Section 2 provides an executive summary of the draft Decommissioning Programme.

Section 3 provides background information relevant to the development concerning the physical, biological and human environments, and statutory nature conservation designations.

Section 4 is a detailed description of the development items and facilities that are to be decommissioned.

Section 5 provides a description of the proposed decommissioning options, the principles that guide the selection of the final decommissioning option, and the proposed decommissioning process.

Section 6 considers the need for a new Environmental Impact Assessment prior to decommissioning activities taking place.

Section 7 provides information about the costs associated with decommissioning.

Section 8 outlines the financial security measures associated with decommissioning.

Section 9 provides details of the approach to the decommissioning schedule.

Section 10 outlines the project management procedures and verification process for the decommissioning plan.

Section 11 details the approach to seabed clearance.

Section 12 details the approach to site restoration.

Section 13 sets out the approach to post decommissioning monitoring, maintenance and management of the site.

Section 14 supporting studies such as the ES and SEIS that were used to inform this draft Decommissioning Programme.

Section 15 references.

Plan Audience

This DP is intended to be referred to by relevant personnel involved in the decommissioning of the EOWDC, including AOWFL personnel, Contractors and Subcontractors. Compliance with this DP will be monitored by AOWFL and reported to the Scottish Ministers.

Plan Locations

Copies of this DP are to be held in the following locations:

- At AOWFL Head Office; and

- At the premises of any agent, Contractor or Subcontractor (as appropriate) acting on behalf of AOWFL during the decommissioning process.

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LIST OF ABBREVIATIONS AND DEFINITIONS

Defined Terms

Term	Definition
Application	The Application and Environmental Statement submitted to the Scottish Ministers, by the Company on 1st August 2011 and Supplementary Environmental Information Statement submitted to the Scottish Ministers by the Company on 6th August 2012 for consent under section 36 of the Electricity Act 1989 and for a Marine Licence under 20(1) of the Marine (Scotland) Act 2010, for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC) electricity generating station approximately 2 km off the coast of Aberdeenshire in Aberdeen Bay with a generation capacity of up to 100 MW.
Cables	Offshore Export Cables and Inter-array cables
Commencement of the Development	The date on which the first vessel arrives on the Site of European Offshore Wind Deployment Centre to begin construction in accordance with the section 36 Consent.
Commencement of the Works	The date on which the first vessel arrives on the Site to carry on any marine Licensable Marine Activity in connection with the construction of the Works, as defined by the Marine Licence.
Company	Aberdeen Offshore Wind Farm Limited (AOWFL). AOWFL is wholly owned by Vattenfall and has been established to develop, finance, construct, operate, maintain and decommission the European Offshore Wind Deployment Centre.
Construction	As defined by the Section 36 Consent, (as per section 64(1) of the Electricity Act 1989, read with section 104 of the Energy Act 2004), construction is defined as follows: "construct", in relation to an installation or an electric line or in relation to a generating station so far as it is to comprise renewable energy installations, includes: • placing it in or upon the bed of any waters; • attaching it to the bed of any waters; • assembling it; • commissioning it; and • installing it.
Contractor	Any Contractor/Supplier (individual or firm) working on the project, hired by AOWFL.
Decommissioning of the Works	The removal of the Works from the seabed, demolishing or dismantling the Works.
Design Statement (DS)	The Statement to be submitted for approval under Condition 14 of the section 36 Consent.

Term	Definition
Development	The European Offshore Wind Deployment Centre electricity generating station in Aberdeen Bay, approximately 2 km east of Blackdog, Aberdeenshire, as described in Annex 1 of the section 36 Consent.
Development Area	The area which includes the wind turbine generators, the Inter-array cables and part of the Offshore Export Cable Corridor, including any other works, as shown in Part 4 of the Marine Licence (named as Lease Boundary in the Marine Licence).
Electricity Act	the Electricity Act 1989 (as amended).
Energy Act	The Energy Act 2004.
Environmental Statement (ES)	The Statement submitted by the Company on 1 August 2011 as part of the Application.
Final Commissioning of the Development	The date on which all WTGs forming the Development have supplied electricity on a commercial basis to the National Grid, or such earlier date as the Scottish Ministers deem the Development to be complete, as defined by the section 36 Consent.
Final DP	It is anticipated that the development of a Final Decommissioning Programme will occur in approximately Year 20 after final commissioning of the Development.
Inter-array cables	Electricity cables connecting the WTGs.
Licensing Authority	Scottish Ministers, as defined by the Marine Licence. It is important to note that Marine Scotland is acting on behalf of Scottish Ministers.
Marine Licence	Licence issued by the Scottish Ministers under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Export Cable Corridor.
Offshore Consents	• Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC; • Declarations granted under section 36A of the Electricity Act 1989 to extinguish public rights of navigation so far as they pass through those places within the territorial sea where structures forming part of the Offshore Wind Farm are to be located; and • Marine Licence under Part 4 of the Marine (Scotland) Act 2010 for construction works and deposits of substances or objects in the Scottish Marine Area in relation to the Offshore Wind Farm and Export Cable Corridor.
Offshore Export Cables (OECs)	The offshore export cables (and all associated cable protections) connecting the Wind Turbine Generators to the onshore export cables.

Term	Definition
Offshore Export Cable Corridor (OECC)	The consented area within which the offshore export cables will be laid up to MHWS.
Offshore wind farm	An offshore generating station which includes proposed WTGs, inter-array cables, meteorological masts and other associated and ancillary elements and works (such as metocean buoys). This includes all permanent and temporary works required.
Ramsar Site	A wetland site of international importance under the Ramsar Convention.
Section 36 Consent	Consent granted under section 36 of the Electricity Act 1989 for the construction and operation of the EOWDC.
Subcontractor	Any Contractor/Supplier (individual or firm) providing services to the project, hired by the Contractors (not AOWFL).
Supplementary Environmental Information Statement (SEIS)	The Addendum submitted to the Scottish Ministers by the Company on 6th August 2012 as part of the Application.
the Statement	The UK Marine Policy Statement 2011
the Works	The European Offshore Wind Deployment Centre electricity generating station in Aberdeen Bay, approximately 2 kilometres east of Blackdog, Aberdeenshire, as described by the Marine Licence.

Acronym Definitions

Term	Definition
AOWFL	Aberdeen Offshore Wind Farm Limited
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BEIS	Department for Business, Energy and Industrial Strategy
BMAPA	British Marine Aggregate Producers Association
BPEO	Best Practicable Environmental Option
BSB	Below Seabed
CAA	The Civil Aviation Authority
DECC	Department for Energy and climate Change (superseded by Department for Business, Energy and Industrial Strategy (BEIS))
DS	Design Statement
EIA	Environmental Impact Assessment
Electricity Act	the Electricity Act 1989 (as amended)
ENE	East-northeast
EOWDC	European Offshore Wind Deployment Centre
ES	Environmental Statement
GRE	Glass-Fibre Reinforced Epoxy
HSSE	Health, Safety, Security and Environment
km	Kilometre
LAT	Lowest Astronomical Tide
m	Metres
m/s	Metres per second
MCA	The Maritime and Coastguard Agency
MHWS	Mean High Water Springs
nm	Nautical miles
MS	Marine Scotland

Term	Definition
MS-LOT	Marine Scotland - Licensing and Operations Team
MW	Megawatt
NLB	Northern Lighthouse Board
NtM	Notice to Mariners
OEC	Offshore Export Cable
OECC	Offshore Export Cable Corridor
O&M	Operation and Maintenance
OSPAR	Oslo/Paris Convention (for the protection of the marine environment in the North-East Atlantic).
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SEIS	Supplementary Environmental Information Statement
SNH	Scottish Natural Heritage
SoS	Secretary of State
SPA	Special Protection Area
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
WMP	Waste Management Plan
WTG	Wind Turbine Generator

1 INTRODUCTION

1.1 Background

On 26 March 2013, Aberdeen Offshore Wind Farm Limited (AOWFL) received consent from the Scottish Ministers under Section 36 (S.36) of the Electricity Act 1989 for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC - also known as the Aberdeen Offshore Wind Farm) and on 15 August 2014 a Marine Licence was granted under section 25 of the Marine (Scotland) Act 2010 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

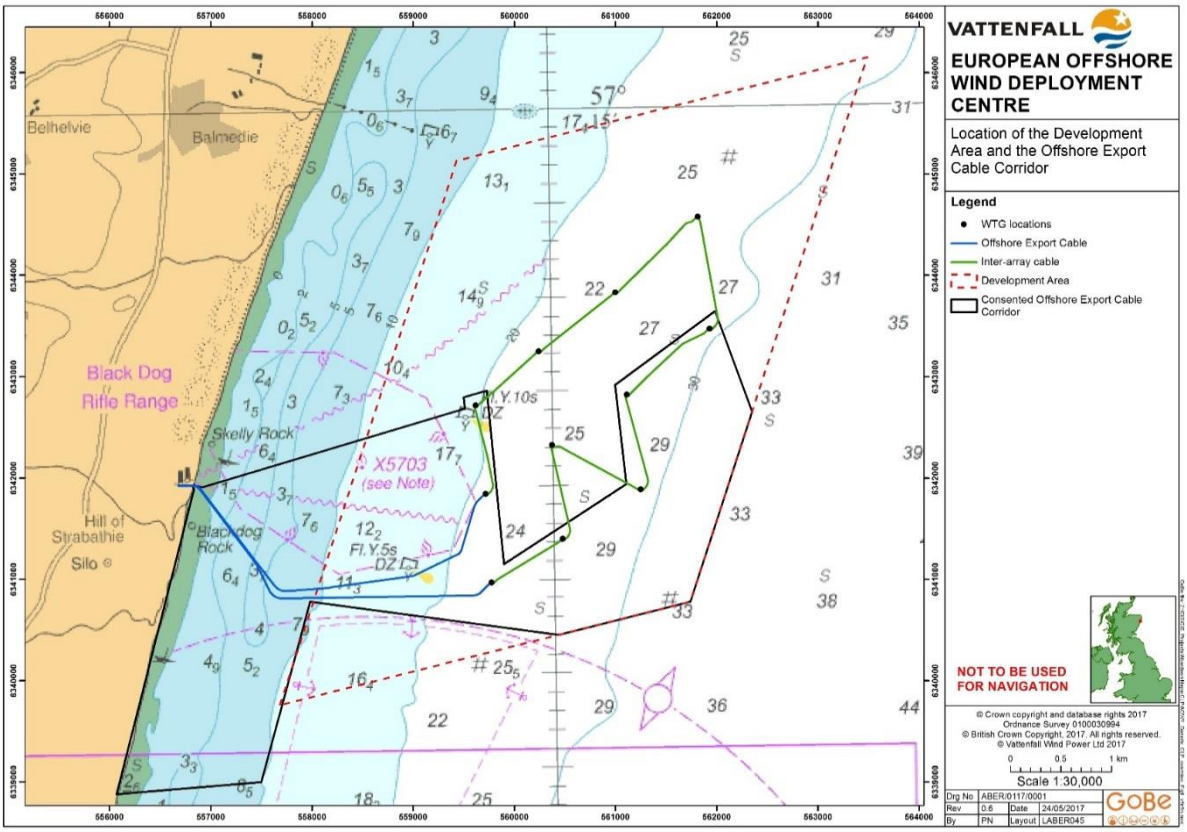
The Development is located approximately 2 to 4.5 km offshore to the north east of Aberdeen, Scotland, within Aberdeen Bay. The Offshore Export Cables (OECs) will each be between 3.7 – 4.4 km long (maximum total length ~8 km) and will reach landfall at the adjacent coastline in Aberdeen Bay located at Blackdog.

A further overview of the Development is contained in Section 3 of this document. AOWFL is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain and decommission the EOWDC.

The purpose of this Decommissioning Programme (DP) is to provide it to the Scottish Ministers and relevant stakeholders for consultation and in line with the relevant guidance. The Decommissioning Programme will then be updated following stakeholder consultation prior to re-submission to the Scottish Ministers[1] for final approval.

[1] Previously approval was by Secretary of State (SoS) for the The Department of Business, Energy and Industrial Strategy (BEIS), formally the Department of Energy and Climate Change (DECC), in consultation with the Scottish Ministers, and prior to the Commencement of the Development in line with the requirements of Condition 6 of the Section 36 consent and pursuant to Sections 105(2) and (5) of the Energy Act 2004. Responsibility for approval of decommissioning programmes under the provisions of the Energy Act 2004 for Scottish projects has now been transferred to Scottish Ministers.

Figure 1 Location of the EOWDC Development Area and the Consented Offshore Export Cable Corridor



1.2 Consent Conditions

The S.36 Consent and Marine Licence contain a variety of conditions that must be discharged through approval by the Scottish Ministers/Licensing Authority prior to the commencement of any offshore construction works. These requirements include the submission of a Decommissioning Programme for subsequent approval. The aim of this plan is to set out the proposed decommissioning procedures for the EOWDC.

The relevant conditions setting out the requirements for a Decommissioning Programme, that are to be discharged by this document, are presented in full in Table 1.

Table 1 - Consent conditions to be discharged by the DP

Consent Document	Condition Reference	Condition Text	Where Addressed
Section 36 Consent	Condition 6	Commencement of the Development must not proceed until after the Company has submitted to the Secretary of State a decommissioning programme in compliance with a notice served upon the Company by the Secretary of State following consultation with the Scottish Ministers, pursuant to Sections 105(2) and (5) of the Energy Act 2004.	This document sets out the Decommissioning Programme for consultation. A final Decommissioning Programme will be submitted for approval by the Scottish Ministers [2].
	Reason	To ensure that a decommissioning plan is submitted to the Secretary of State following consultation with the Scottish Ministers before any construction commences.	

1.3 Structure of this Decommissioning Programme

In response to the specific requirements of the S.36 Consent conditions, this DP has been structured so as to be clear that each part of the specific requirements has been met and that the relevant information to allow MS-LOT to approve the DP has been provided. The document structure is set out in Table 2 and follows the structure set out in the relevant decommissioning plan guidance provided by DECC (DECC, 2011).

Table 2 - DP document structure

Section		Summary of Content
1	Introduction	Provides a background to the project, the purpose and scope of this Decommissioning Programme and the relevant consent conditions.
2	Executive summary	Provides an overview of the Decommissioning Programme such that the reader can become familiar with the document without reading it in its entirety.
3	Background information	Provides an overview of the development and a description of the physical, biological and human environments, as well as statutory nature conservation sites.
4	Description of items to be decommissioned	Provides a description of the components and facilities that are considered in the decommissioning of the EOWDC.
5	Description of proposed decommissioning measures	A detailed description of the decommissioning measures considered, the principles that guide the decommissioning options consideration and the proposed decommissioning process.
6	Environmental impact assessment	Consideration as to whether a new EIA will be required for decommissioning activities.
7	Costs	Proposed strategy for providing details of the costs of decommissioning.
8	Financial security	Financial security which the companies that are party to the programme propose to provide.

[2] The responsibility for approving decommissioning programmes for Scottish projects has now been transferred to the Scottish Ministers.

Section		Summary of Content
9	Schedule	Details of the approach to scheduling decommissioning activities.
10	Project management and verification	Information on how AOWFL will manage the implementation of the DP.
11	Seabed clearance	Information relating to steps that will be taken in order to confirm that the seabed has been cleared following decommissioning, including information on site surveys and schedules.
12	Restoration of the site	Description of how AOWFL intends to restore the site as far as reasonably practicable, to the condition that it was in prior to the construction of the installation.
13	Post-decommissioning monitoring, maintenance and management	The outlined approach to post-decommissioning monitoring, maintenance and management.
14	Supporting studies	Relevant supporting studies that were used to inform the DP.
15	References	Lists the documents cited within the Plan.
Appendix A	Nature Conservation Designations	Table of nature conservation designations (Special Area of Conservation (SAC) and SPA (Special Area of Protection) in relation to Section 3.5)
Appendix B	Financial Security	Commercial In Confidence

2 EXECUTIVE SUMMARY

On 26 March 2013, Aberdeen Offshore Wind Farm Limited (AOWFL) received consent from the Scottish Ministers under Section 36 (S.36) of the Electricity Act 1989 for the construction and operation of the European Offshore Wind Deployment Centre (EOWDC - also known as the Aberdeen Offshore Wind Farm) and on 15 August 2014 a marine licence was granted under section 25 of the Marine (Scotland) Act 2010 (reference 04309/16/0). This Marine Licence was most recently varied on 30 September 2016 (reference 04309/16/1).

AOWFL is a company wholly owned by Vattenfall and was established to develop, finance, construct, operate, maintain, and decommission the EOWDC.

The Project is seeking to develop the EOWDC approximately 2 to 4.5 km offshore to the north-east of Aberdeen, Scotland, within Aberdeen Bay and will consist of 11 turbines. Generated electricity will be transmitted to shore via two ~4 km subsea offshore export cables totaling up to ~8 km in length, with a landfall location at Blackdog, within Aberdeen Bay, where it will be connected to an onshore substation and to the National Grid Network.

This Decommissioning Programme has been prepared in order to satisfy the relevant conditions contained within the S. 36 Consent and the requirements of the Energy Act 2004.

The proposed measures set out in this DP adhere to the existing UK and international legislation and guidance notes and have regard to decommissioning best practice. Methods outlined are presented based on currently available technology. It is expected that by the time of decommissioning, significant technological developments could result in different approaches being taken to the decommissioning activities and such changes will be reflected in future revisions of the DP.

The DP details the methods associated with the future end of life decommissioning of the Development. It has been prepared on the basis of known site characteristics and consent conditions. This DP is informed and supported by the Environmental Statement (ES) and Supplementary Environmental Information Statement (SEIS) prepared for the Development and submitted as part of the Application for consents. The ES and SEIS provide detailed analysis of the baseline physical, biological and human environment, and present an assessment of the likely significant effects of the Development on the receiving environment, taking into account decommissioning provisions that are consistent with those presented in this document.

In advance of decommissioning, the Environmental Impact Assessment (EIA) will be reviewed to assess the potential impacts that may arise and that were not covered in the initial EIA process and subsequent reviews. At this point, a decision will be made by AOWFL, in consultation with the Scottish Ministers, as to whether a more detailed assessment of the likely significant effects of decommissioning is required.

It is expected that decommissioning of the EOWDC will involve complete removal of all components from the site. Subsea cables will be removed unless it can be demonstrated

closer to the time that they do not pose a risk to other users of the sea and/or removing them leads to a greater environmental impact than leaving them *in situ*.

In considering appropriate decommissioning provisions AOWFL has sought to adhere to the following key principles as set out in DECC guidance (DECC, 2011) on decommissioning offshore renewable energy installations under the Energy Act 2004, namely:

- Best Practicable Environmental Option (BPEO), which is the option with the most benefit or least damage to the environment as a whole at an acceptable cost. This involves balancing the reduction in environmental risk with practicality and cost of reducing the risk;
- Consideration of the rights and needs of legitimate users of the sea;
- Safety of surface and subsurface navigation; and
- Health, Safety, Security and Environment (HSSE) considerations.

This document also provides a strategy for dealing with the decommissioned components. These will include recovered steel, copper and glass fibre composites. The proposed strategy will be to re-use and recycle as much material as possible.

The Development is consented for, and has an anticipated operational period of 22 years following final commissioning, and in the absence of re-powering, decommissioning would be required at the end of the operational period. The final schedule of decommissioning works will be determined once the DP has been reviewed by AOWFL two years prior to the end of the operational period (approximately year 20 of operation). The timing of the review ensures that the project is sufficiently close to the commencement of decommissioning for the information, methods and legislation 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.

A cost estimate for the DP has been derived based on the equipment and personnel requirements and the duration of the works. Financial security has been carefully considered to ensure that the liability will be met and an approach to this has been set out for approval by the Scottish Ministers. The cost estimate and financial security will be provided to Scottish Ministers in confidence as part of the final DP submitted for approval.

This DP is considered sufficient to meet the requirements set out under Section 105 of the Energy Act 2004; the submission of this DP for formal approval by the Scottish Ministers is also considered sufficient to satisfy the S.36 Consent Condition 6.

3 BACKGROUND INFORMATION

3.1 The Development

This section provides a brief overview of the EOWDC. The Development will consist of the following main components:

- 11 Wind Turbine Generators (WTGs);
- Three legged jacket substructures each installed on suction bucket foundations;
- A network of circa 9.7 km of Inter-array cables; and
- Two buried or mechanically protected, subsea OECs, totaling up to ~8 km in length, to transmit the electricity from the WTGs to the cable landfall location at Blackdog, within Aberdeen Bay, and connecting to the onshore buried OEC for transmission to the onshore substation and connection to the National Grid network.

Further details of the wind farm layout and design has been set out, for approval, in the Design Statement (ABE-ENV-BD-0017).

3.2 Physical Environment

A range of surveys were completed to establish the physical characteristics of the Development Area. These studies informed the Environmental Impact Assessment (EIA) for the Development and are reported as part of the ES and SEIS. These studies form the basis for this section of the DP. The following sections provide sufficient information to inform consideration of the decommissioning provisions and in line with the requirements of the DECC guidance (DECC, 2011).

3.2.1 Metocean Characteristics

The climate along the east coast of Scotland is heavily influenced by the weather systems and large scale currents of the North Atlantic. Average predicted wind speeds are approximately 8.4 metres per second (m/s) at 109 metres (m) above Lowest Astronomical Tide (LAT). Predominant wind directions are from the south and north-north-west.

3.2.2 Topography and Bathymetry

The general bathymetry of the Development Area and Offshore Export Cable Corridor (OECC) is characterised by a sloping seabed as you move offshore, deepening to the east north-east. The depths recorded by site specific surveys range from approximately 0.8 m to 35.1 m below LAT.

In the shallow inshore section, depths increase from 0.8 m to 6 m in an irregular channel. To the east of this channel, there is a series of linked narrow bank features running parallel to the shore. In places, the depth decreases to 2 m below LAT. These banks are asymmetrical, with the steeper side facing west. The seabed then slopes east-south-east with decreasing gradient, continuing to decrease further offshore.

3.2.3 Geological Characteristics

Surface geology identified from geophysical surveys determined that the sediments over most of the Development Area and OECC were predominantly slightly silty sands, which are frequently shelly. In the inshore region of the OECC there are outcrops of glacial (clayey) till.

Depositional ripple features are apparent towards the intertidal area, with megaripples within the gravel areas and other features in the silty sand up to 1,500 m from the shoreline.

The offshore geotechnical surveys carried out between 2013 and 2016 revealed that the seabed generally comprises of very loose to dense sand (Forth Formation), normally 1-2 m thick, but at the deeper side of the site the thickness increases to as much as 8.5 m. The surface sands (top 1-2 m) tend to be densified probably as a result of wave action.

The sand layer is underlain by glaciomarine clays (St Abbs Formation) and has been identified across most of the site to a maximum thickness of approximately 15 m. Underneath this formation lies the Wee Bankie glacial till (clayey with boulders, cobbles and gravel), which at the nearshore section outcrops at seabed and extends to the rockhead of the Old

Red Sandstone. From geophysical seismic datasets it can be inferred that the rockhead tends to dip towards the east-northeast (ENE) direction from 2-5 m below seabed in the nearshore section to 25-30 m below seabed (BSB) at the farthest part of the site.

3.2.4 Tidal Processes

The tidal range within the Development Area is 3.4 m and 1.7 m under mean spring and neap tidal conditions, respectively. Peak tidal currents have been measured at less than 1.1 m/s (near surface) within the Development Area at approximately the times of high and low water, with slack water occurring mid-tide. The tidal axis is orientated approximately shore parallel, flooding towards the south-southwest and ebbing towards the north-northeast. Flood currents are slightly stronger than those of the ebb tide. The rectilinear nature of the tide increases from near-surface to the mid-water column.

3.2.5 Wave Regime

The most frequently occurring waves within the Development Area (based on observations made during a five month winter survey) are between 0.5 and 1.0 m significant wave height and originate from the southeast. The largest wave heights recorded within this period are of the order of 5.5 m and originate from the east. Further offshore, due to the absence of coastal sheltering, south-westerly wave directions predominate.

3.3 Biological Environment

3.3.1 Benthic Environment

A subtidal benthic survey was conducted in 2010, which indicated that the seabed consisted of fine and muddy sands. Inshore areas had lower mud content than the deeper stations further offshore. The predominant species recorded were the polychaete worm *Notomastus latericeus*, and the bivalves *Nucula nitidosa* and *Tellina fabula*. The infaunal communities increased in diversity and abundance with distance from the shore and were characterised by two biotopes: *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand (SS.SSA.IFiSa.NcirBat) in inshore areas and *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSA.CMuSa.AalbNuc) further offshore.

Trawl sampling indicated that *Crangon crangon* (brown shrimp), *Ophiura ophiura* (brittlestar) and *Liocarcinus holstatus* (a swimming crab) were the most dominant epifaunal invertebrate species. The distribution of these species was associated with muddier sediment types. The three most abundant fish species recorded during the trawl surveys were dab (*Limanda limanda*), plaice (*Pleuronectes platessa*) and whiting (*Merlangius merlangus*); all three of which are commercial species. Plaice and dab were caught in greater numbers at the sandier inshore stations.

3.3.2 Fish and Shellfish Ecology

No known spawning grounds are present in the proposed Development Area. Spawning grounds do occur further offshore (for herring (*Clupea harengus*)), on coarser sediments (for sandeel (*Ammodytes marinus*), or on muddier sediments (for *Nephrops*) than those present in the Development Area.

Juvenile salmon and sea trout are thought to transit through (or in close proximity to) the site on their seaward migration, with adult salmon and sea trout transiting through (or in close proximity to) the site on their return migration to the various salmon rivers in the area (and locally the River Don). Sea trout are also present in the vicinity of EOWDC and transit the site as part of their foraging activity.

3.3.3 Marine Mammals

Several marine mammal species have been recorded (sighting and/or stranding) in Aberdeen Bay and the surrounding area; including 12 odontocete species and three pinniped species. Of these, bottlenose dolphin, harbour porpoise, white-beaked dolphin, minke whale, Risso's dolphin, harbour seal and grey seal occur regularly in the area, with other species being recorded occasionally or rarely.

3.3.4 Ornithology

A total of 79 species of bird were recorded from site specific surveys including 20 seabird species and four species of wildfowl. These species included Fulmars, Gannets, Cormorants and Shags, Great and Arctic Skua, Kittiwakes, Black Headed Gull, Common Gull, Lesser Black-backed gull, Herring Gull, Great Black-backed Gull, Sandwich and Arctic Terns, Puffins, Guillemots, Razorbills, Common Eider, Common Scoter, Pink-footed Goose and Barnacle Goose.

3.4 Human Environment

3.4.1 Seascape, Landscape and Visual

Being located just over 2 km east off the Aberdeenshire coast, the Wind Turbine Generators (WTGs) will be visible from the surrounding landscape and seascape environments. Receptor groups include visitors and walkers of the coastal path, and receptors at sea, such as recreational sailors as well as local residents on the adjacent coastline.

3.4.2 Marine Archaeology

A total of two sites designated as of anthropogenic origin and of archaeological interest (WA 7071 and WA7072) were identified during the assessment of geophysical survey data, located approximately 40 m apart. WA 7071 is a previously uncharted wreck site and WA 7072 is possibly a large piece of debris relating to a wreck. Both are in close proximity to WTG 8 (maximum distance around 60 m). No other specific wreck sites have been identified

through geophysical survey interpretation, however a magnetic anomaly (WA 7070), potentially an unknown wreck or aircraft crash site, is situated close to the location of WTG 3 (maximum distance around 40 m).

The shallow geological sequence underlying much of the Development Area represents a prograding shoreline sequence and records changes in sea level in the area since the Last Glacial Maximum. The sandy sediment type suggests that potentially important organic paleo-environmental indicators may not have been preserved and that pre-historic archaeological material, if present and preserved, could mainly be lithic in nature.

3.4.3 Offshore Wind Farms

With regard to renewable energy installations and power cables, no other wind farms are currently sited or planned for development near the proposed development site. The closest wind farm developments to the EOWDC site are the proposed Kincardine Offshore Wind Farm to the south (approximately 20 km), Hywind to the north east off of Peterhead (approximately 40 km), and the proposed Firth of Forth developments 58 km to the south and the Moray Firth developments 117 km to the north.

3.4.4 Oil and Gas Exploration and Related Activities

No oil and gas installations were identified near the Development Area and OECC, nor any aggregate extraction sites. On the north-east coast, the St. Fergus gas terminal is the largest single gas importing facility in the UK, receiving gas from a large number of North Sea fields. However, it is located far north of the Development Area (approximately 40 km). Oil production from a number of central and northern North Sea fields feeds into the main pipeline at the Forties Charlie platform from where it is transported 175 km to Curden Bay. These installations are located well to the north of the Development Area.

3.4.5 Subsea Cables

There are no anticipated conflicts with existing, planned or out-of-service cables.

3.4.6 Ports and Harbours

There are three principle ports close to Aberdeen and the surrounding area (Aberdeen, Peterhead and Fraserburgh), plus a number of smaller ports and harbours used for commercial and fishing activities such as Banff, Buckie, Gourdon, Johnshaven, MacDuff, Portsoy and Stonehaven. Aberdeen is the major supply base for the North Sea oil industry. Peterhead is the UK's largest fishing port and is also a major oil industry support base.

The nearest WTG will be located over 2 nm from the northern limits of Aberdeen Harbour.

3.4.7 Shipping Activities

Shipping in the vicinity of the Development Area includes commercial shipping, fishing and recreational activity. In addition to the oil and gas support services, there are regular shipping

services to Orkney, Shetland and Scandinavia via Ro-Ro services for passengers and cargo, with over 140,000 passengers passing through the port in 2009.

3.4.8 Commercial Fishing

Only low levels of fishing activity have been recorded within the boundaries of the EOWDC site, largely as a result of the poor productivity of the area. Four local vessels were identified as operating within the general area of the site, all of which are inshore demersal trawlers. These vessels are 11 m and under in length, with two registering their home port as Aberdeen and two as Peterhead. The fishing grounds of these vessels were stated to be between Aberdeen Harbour Fairway Buoy and the buoys off the Black Dog Firing Range, with the main target species being plaice. In addition to trawling, three of the vessels have the capacity to deploy creel gear.

3.4.9 Aviation

The Development Area is within 10 km of the secondary radar facility at Aberdeen airport. The project has negotiated a contract with National Air Traffic Services (NATs) to determine the most efficient and effective technical solution to this issue.

As part of the agreement on the final layout of the EOWDC, it has been agreed that the northern helicopter route will be moved to the north, thereby allowing a greater clearance between the EOWDC and Aberdeen Harbour entrance. The project has entered into a contract with NATs in order to apply for an Air Space Change, which would be implemented by NATs in consultation with the Aviation Working Group.

3.4.10 Military Interests

The Development will be in line of sight to and 26 km from the Air Defence radar at Buchan.

The site is also just offshore from the Blackdog Firing Range. Although no WTGs will be within the firing range offshore safety exclusion zone, provisions will be made for vessels entering the site for decommissioning activities. Further detail on the provisions made for the Blackdog Firing Range is outlined in the Blackdog Firing Range Management Plan (ABE-ENV-DB-0013) has been submitted for approval by the Scottish Ministers, in consultation with the MOD.

3.5 Nature Conservation Designations

The Development Area is adjacent to the Ythan Estuary draft Special Protection Area (dSPA), which features the qualifying species of sandwich tern and little tern. This is a newly proposed site in Aberdeen Bay that was brought forward following the production of the ES. It is an extension of the Ythan Estuary, Sands of Forvie and Meikle Lock Special Protection Area (SPA).

The next closest European designations to the Development are located at a distance of 7.5 and 7.2 km respectively, and are the River Dee Special Area of Conservation (SAC) and the Ythan Estuary, Sands of Forvie and Meikle Loch SPA and Ramsar Site. These sites are designated for the conservation of Freshwater Pearl Mussel, Atlantic Salmon and Otter, and breeding bird interests respectively.

Information on European designated site considered in the assessment undertaken during the consenting of the Development are provided in Appendix A.

4 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

4.1 Introduction

At the end of the operational life and consented period of the Development (after approximately 22 years from its commissioning) it is expected that all structures will be removed by reverse lay, whereby components are removed in the reverse order to that which they were installed.

This would potentially involve the removal of:

- 11 WTGs;
- Their support structures and foundations; and
- Associated Inter-array and OECs[3].

Error! Reference source not found. in Section 3 shows the location and layout of the development components to be decommissioned.

4.2 Development Components to be Decommissioned

4.2.1 WTGs

Horizontal axis WTGs are made up of three main external components:

- Rotor – comprised of the blades and hub;
- Nacelle – housing the drivetrain (including gearbox and generator) and supporting equipment; and
- Structural support – includes the tower and rotor yaw mechanism which allows the WTG rotor to turn against the wind.

4.2.2 WTG Foundations and Jacket Structures

Each WTG support structure to be decommissioned is composed of a three-legged jacket substructure, secured to the seabed by three suction bucket foundations. Suction bucket foundations have the advantage over pile-driven foundations of being easier and less time consuming to remove.

4.2.3 Inter-array cables and OECs

A network of circa 9.7 km of inter-array cables will connect the WTGs to one another. Up to two buried or mechanically protected subsea OECs, totaling up to 8 km in length, will

[3] Subsea cables will be removed unless it can be demonstrated closer to the time that they do not pose a risk to other users of the sea and/or removing them leads to a greater environmental impact than leaving them *in situ*.

transmit the electricity from the WTGs to the landfall location at Blackdog, within Aberdeen Bay, and connecting to the onshore buried onshore cables for transmission to the onshore substation and connection to the National Grid Network.

4.2.4 Summary of development components to be decommissioned

A summary of EOWDC components to be decommissioned is provided in Table 3.

Table 3 - Summary of Development components to be decommissioned

Component	Key dimensions and specifications
WTGs	
WTGs	11
WTG rotor blades	11 x 3
WTG nacelles	11
WTG tower	11 towers in 3 sections
Foundations and Substructures	
Suction bucket foundations	11x 3 suction buckets
3 legged jacket substructures	11
Inter-array cables	
Inter-array cabling	66 kV AC cables totaling ~9.7 km
Maximum cable cross section	400 mm^2
Estimated burial depth	Approximately 1.0 m
OECs	
OECs	2 x 66 kV AC cables totaling Up to ~8 km
Maximum cable cross section	400 mm^2
Estimated burial depth	Approximately 1.5 m

5 DESCRIPTION OF PROPOSED DECOMMISSIONING MEASURES

5.1 Introduction

This section is an overview of the available options for the decommissioning of the EOWDC and describes the proposed measures for the decommissioning of the components described in the previous section.

5.2 Decommissioning Options

A number of alternative options have been considered for decommissioning of the Development which are set out below. Towards the end of the operational life of the EOWDC a final decision on the approach to decommissioning will be made. This will take into consideration the guiding principles of BPEO (Best Practicable Environmental Option), commercial viability and Health, Safety, Security and Environment (HSSE) risks.

The current option for decommissioning (complete removal of the components by reverse lay) is set out in Section 5.4. However, a number of other 'end of life' options that may be considered are set out below prior to the detailed consideration of the proposed decommissioning proposals

5.2.1 Decommissioning and construction of a new wind farm

For this scenario the assumption has been made that wind energy is still economically attractive 22 years after commissioning but the technical integrity of the Development 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 for a few extra years of running time on the existing Development. Under such a scenario, and subject to all necessary consents being granted, the existing Development would be decommissioned (following the process set out under Section 5.4 below) and a new development erected.

5.2.2 Re-powering

In this scenario it is assumed that wind energy is still economically attractive 22 years after commissioning, the technical integrity of the WTGs is declining but the electrical infrastructure and possibly the foundations remain sound. If the electrical infrastructure is installed properly its lifetime could be up to 50 years, whilst experience from the oil and gas industry indicates that the lifetime of foundations can also be extended outside the 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 re-powering of the Development – that is fitting new WTGs to the existing foundation and electrical systems.

5.2.3 Step-down

This scenario assumes it is not profitable to invest in new technology but that most WTGs will continue to perform sufficiently beyond the design lifetime of 25 years. Under this scenario, the Development would be decommissioned through a controlled step-down. In this case WTGs would be gradually shut down as their technical integrity declined. A decommissioning campaign would most likely be undertaken when the complete Development was shut down, but could also be undertaken in a stepwise process if this was 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.

5.3 Guiding Principles

When considering the alternative options for the full decommissioning of the Development, any decision made should be in line with the following set of guiding principles:

- BPEO – the option that has the greatest benefit or least damage to the environment. The BPEO balances the reduction of environmental risk with practicability and the cost of reducing the risk;
- Rights and needs of other users of the sea at the time;
- Navigational safety; and
- HSSE considerations.

In accordance with DECC Guidance (DECC, 2011) 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, which is reported in the ES and SEIS. The information relating to decommissioning in the ES and SEIS will be reviewed if the final decommissioning methods and programme are substantially different from those detailed within this DP. If necessary, more detailed assessment will be undertaken to accompany the application(s) for Marine Licence(s) which will be required for the decommissioning of the Development.

In considering the proposed DP for the development, AOWFL will seek solutions for each offshore element of the Development to follow the guiding principles listed in Table 4.

Table 4 - Guiding principles in considering the proposed Decommissioning Programme

Guiding Principle	Comments
No harm to people	Adhering to the highest standards of health and safety throughout the lifecycle of the project. AOWFL seeks to promote safe practices and minimize risk in the Development and implementation of decommissioning solutions.
Consider the rights and needs of legitimate users of the sea	Respecting the rights and needs of other legitimate users of the sea. Decommissioning activities will seek to minimize 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, AOWFL 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	AOWFL'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	AOWFL 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 BATNEEC (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.

5.4 Proposed Decommissioning Process

This section provides an outline of the decommissioning process for WTGs, foundations, Inter-array cables and OECs. It summarises the proposed decommissioning process with reference to the guiding principles in the previous section, to justify the proposed method of decommissioning.

5.4.1 WTGs

The structures above the seabed will be removed piece by piece in the reverse order of the construction procedure using cranes. Alternatively, the entire structure could be removed in one singe lift using a heavy lift vessel. At the end of the operational lives of the individual WTGs, they would be removed and either refurbished or recycled. The decommissioning process for WTGs would typically involve:

- De-energizing and isolation from the electrical grid, which may be completed in stages;
- Mobilisation of a suitable heavy-lift vessel to the EOWDC location;
- Removal of the rotor component parts;
- Disconnection of the turbine from Inter-array cables;
- Removal of the nacelle, including the electrical generator;
- Removal of the WTG tower, which may be completed in stages; and
- Transport of all WTG components to an onshore site where they would be processed for re-use, recycling or safe disposal.

Table 5 below provides an assessment of the wind-turbine decommissioning process against the guiding principles outlined in Table 4.

Table 5 - Assessment of proposed WTG decommissioning process against guiding principles.

Guiding Principle	Comments
No harm to people	The safest option, involving standard procedures and minimal offshore work.
Consider the rights and needs of legitimate users of the sea	Complete removal of the WTGs is considered the best long term solution. Appropriate notification and consultation prior to temporary works to minimise disruption.
Minimise environmental impact	Risk of spillage as a result of all potential pollutants being fully contained within the nacelle being removed in a single lift operation. All subsequent dismantling will take place onshore thereby minimizing the potential for pollution incidents.
Promote sustainable development	WTGs and support structures will be completely removed from the site, ensuring no ongoing environmental impacts and no restriction on future use of marine resources.
Adhere to the Polluter Pays Principle	Entirely consistent with this principle – complete removal and disposal.
Maximise re-use of materials	All dismantling of individual major components to take place onshore, maximizing the potential for re-use and recycling.
Ensure commercial viability	Most commercially viable solution – minimal works offshore and maximum potential for re-sale/re-use value from turbine components with minimum residual risk.
Ensure practical integrity	Known, tried and tested, procedures and reduced risks due to minimising of offshore activity.

5.4.2 WTG Foundations and Jacket Structures

The WTG foundations and substructures would be removed following the removal of the WTGs. The jacket substructures and suction bucket foundations would most likely be

removed as one piece using a heavy lift vessel. Suction bucket foundations allow for water to be pumped into them, creating a pressure differential between the inside of the foundation and the surrounding seawater, easing their lift. This enables the full foundation to be recovered for re use or recycling eliminating the need for steel foundations to be cut off at or below the seabed, and reducing waste left *in situ*.

The table below provides an assessment of the WTG foundations and jacket structures decommissioning process against the guiding principles outlined in Table 6.

Table 6 - Assessment of the proposed WTG foundations and Jacket structures decommissioning process against guiding principles.

Guiding Principle	Comments
No harm to people	Heavy lift and removal to shore for disassembly minimises the amount of work offshore.
Consider the rights and needs of legitimate users of the sea	Complete removal of the structures is considered the best long term solution. Appropriate notification and consultation prior to temporary works will work to minimise disruption.
Minimise environmental impact	Minimal risk of environmental impact arising from suction bucket foundation lifting and removal. Subsequent dismantling or cutting would take place onshore, minimising the potential for environmental impacts at sea. Suction bucket foundations are fully removed from the seabed with minimal environmental impacts, and without the need for cutting at or below the seabed.
Promote sustainable development	Suction bucket foundations completely removed from the site, ensuring no ongoing environmental impacts and no restriction on the future use of marine resources.
Adhere to the Polluter Pays Principle	Entirely consistent with this principle – complete removal and disposal.
Maximise re-use of materials	Any dismantling to take place onshore. Maximum potential for re-use and recycling.
Ensure commercial viability	Most commercially viable solution – minimal offshore works and maximize potential for re-sale/re-use value with minimum residual risk
Ensure practical integrity	Known, tried and tested, procedures and reduced risks due to minimising of offshore activity.

5.4.3 Inter-array cables and Offshore Export Cables

Subsea cables will be removed unless it can be demonstrated closer to the time that they do not pose a risk to other users of the sea and/or removing them leads to a greater environmental impact than leaving them *in situ*.

The OECs will be buried to a depth of up to 1.5 m below the seabed and inter-array cables up to 1.0 m. Further studies prior to decommissioning will examine if the burial depths of these cables are likely to be sufficient for cables to be safely left *in situ*. If the option to leave *in-situ* is proposed, then contingency plans would be put in place to ensure appropriate actions are carried out if the cables do become exposed.

In the event that cables are decommissioned, the cables would be removed by lifting the cable ends onto a cable retrieval vessel and spooling the cables back onto a drum. A water jetting or similar tool may be required to assist in the retrieval of the buried cables. Any seabed disturbance or trenches left after cable removal would be subsequently infilled by natural tidal action.

Cable removal is likely to involve the following process:

- Identify the location of the inter array and/or export cables that need to be removed;
- Buried cables will be located using a grapnel to lift them from the seabed. Alternatively, or in addition, it may be necessary to use a Remotely Operated Vehicle (ROV) to cut and/or attach a lifting attachment to the cable so that it can be recovered to the vessel;
- Seabed material may need to be removed to locate the cable. This is likely to be carried out using a water jetting tool similar to that used during cable installation;
- The recovery vessel will either spool the recovered cable into a carousel or chop it into lengths as it is brought on board before transport to shore; and
- The recovered cables will be stripped and recycled at an appropriate recycling facility.

If the cables were to be left *in-situ*, they would be cut below the seabed and the ends buried below the seabed. Any loose ends that remain from where the main cables are cut at the WTGs would be recovered to shore for subsequent recycling.

Table 7 below provides an assessment of the subsea cable decommissioning process against the guiding principles outlined in Table 4.

Table 7 - Assessment of inter-array and export subsea cable decommissioning process against guiding principles.

Guiding Principle	**Complete removal**	**Cutting and leaving *in-situ***
No harm to people	Risk to personnel not considered excessive.	Burial within the seabed does not pose safety risks to other marine users. Post decommissioning site monitoring would identify any cable exposure with the result that safety risk is minimised.
Consider the rights and needs of legitimate users of the sea	Removal affords maximum flexibility over use of the seabed.	No risk presented from leaving buried cables. Potential for extraction activities is limited. Site is monitored post-decommissioning and any exposure is identified.
Minimise environmental impact	Given the length of the cables (approximately 17.7 km in total), and the need for jetting techniques, removal may cause disruption to the seabed and benthic habitats.	Benign – no environmental impacts associated with leaving buried cables *in-situ*.

Guiding Principle	Complete removal	Cutting and leaving *in-situ*
Promote sustainable development	Disturbance of the seabed in the short-medium term, although complete removal would allow greater flexibility over use of the seabed in the longer term.	Some future activities, e.g. extraction, may be limited.
Adhere to the Polluter Pays Principle	Consistent, assuming suitable disposal option is found for surplus cable components.	Benign – no pollution risk from leaving cables *in-situ*.
Maximise re-use of materials	Maximum material, e.g. copper, potentially available for re-use.	No re-use possible if left *in-situ*.
Ensure commercial viability	Cost of removal high when compared to the burial of cable ends after cutting and leaving *in-situ*.	Limited cost involved with re-burial of cable ends.
Ensure practical integrity	Possible to undertake but would result in impacts on the seabed environment.	N/A

5.4.4 Scour Protection

Scour protection materials may not be completely removed during decommissioning. these materials may provide beneficial marine habitat as artificial reefs by the time of decommissioning and as such it may be the best environmental option to leave them in-situ. However, relevant stakeholders and regulators will be consulted in finalising the Decommissioning Programme to establish the requirements for removal of scour protection material.

If removal of scour protection is deemed necessary, the removal sequence is anticipated to be as follows:

- For the rock armour layer, the individual boulders are likely to be recovered using a grab vessel, and transferred to a suitable barge for transport to an approved onshore site for appropriate disposal or re-use; and
- The filter layer is likely to be dredged and transported to be disposed of at a licensed disposal area (this could be offshore or onshore) or otherwise re-used.

Table 7 below provides an assessment of the scour protection decommissioning process against the guiding principles outlined in Table 4.

Table 8 - Assessment of scour protection decommissioning process against guiding principles.

Guiding Principle	Complete Removal	Leaving *in-situ*
No harm to people	Risk to personnel not considered excessive.	Scour protection left *in-situ* may present a risk to other marine users. Post-decommissioning monitoring may be necessary to identify hazards and so as to minimise risk to others.
Consider the rights and needs of legitimate users of the sea	Removal affords maximum use over the seabed.	Potential for extraction activities and fishing may be reduced depending upon the nature of the scour material left in-situ; post decommissioning monitoring may mitigate any risk by allowing other users to be informed of the remaining hazards.
Minimise environmental impact	Removal of any artificial reef features that may have formed, as well as causing disruption to the seabed environment.	No environmental impacts with the potential benefit of maintaining any artificial reef habitats that may have developed.
Promote sustainable development	Disturbance to the seabed in the short – medium term, however complete removal would allow greater flexibility over use of the seabed in the long term.	Some future activities, e.g. extraction and fishing, may be restricted locally.
Adhere to the Polluter Pays Principle	Consistent with this principle – complete removal.	Not consistent with this principle but option would be by agreement with the regulator and key stakeholders and in light of potential environmental benefits/impacts..
Maximise re-use of materials	Maximum amount of material available for re-use, however much of the recovered material may still be disposed of.	No re-use possible if left in-situ.
Ensure commercial viability	Cost of removal high compared to leaving *in-situ*.	Most commercially viable solution.
Ensure practical integrity	Possible to undertake but would result in impacts to the seabed environment.	N/A

5.5 Proposed Waste Management Solutions

AOWFL is committed to maximising the re-use of waste materials and will give full regard to the 'waste hierarchy' which suggests that re-use 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 at the time and with any necessary disposal taking place at licensed facilities.

A summary of waste material types and their place in the waste hierarchy is provided in Table 9 below.

Table 9 - Waste material types and their place in the waste hierarchy

Waste material	Pre-treatment	Waste management
WTG suction-bucket foundations and substructures	Establish available design life at end of 22 years	Reuse by repowering with new/superior WTGs or other renewable generation technology or dismantle and recycle the recovered steel as much as possible.
Steel from wind-turbine tower and nacelle removed to shore	Break down into transportable size	Recycle
Copper from power cables and WTG transformers	Strip cable from power cables and transformers	Recycle
Glass-Fibre Reinforced Epoxy (GRE) from WTG rotor blades	Break down into transportable size	Disposal or recycle where facilities exist
Used lubricants from WTG	Filter	Disposal or recycle where facilities exist
Non-recyclable materials and fluids	None	Incineration with energy recovery or disposal via landfill. Handling and disposal will follow best practice and MSDS recommendations.
Scour protection materials	None	Reuse or disposal.

The final details of the DP 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.

5.6 Lighting and Marking

The appropriate marking and lighting will be exhibited during the decommissioning of the Development.

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

In relation to navigational safety, lights and markings will be discussed with the Northern Lighthouse Board (NLB), in consultation with the Maritime and Coastguard Agency (MCA). In particular, the NLB will be consulted prior to decommissioning to specify any obstruction marking that may be required during the removal operations. In the event that any obstruction is left on site that may be considered to present a hazard to navigation the necessary marking specified by NLB shall be displayed.

6 ENVIRONMENTAL IMPACT ASSESSMENT

In support of the consent applications, AOWFL prepared an EIA, reported in the ES dated July 2011 and the SEIS (dated 6th August 2012). This took a lifecycle approach to assessing the impacts of the development and in seeking to mitigate and minimise the effect of the works. In all instances, a 'worst case', Rochdale Envelope approach was taken to the assessment. The assessment included the process of decommissioning, as far as it could be predicted at that time.

The information relating to decommissioning within the ES will undergo review when the final details of the DP are confirmed and before decommissioning activities take place. Subject to the results of this review, and taking account of any changes in legislation, changes in the proposed decommissioning methods, or changes in the condition of the baseline environment (beyond those predicted by the ES), it is not currently proposed to undertake a new EIA prior to decommissioning (in line with the relevant DECC guidance).

The consideration of a number of items of key information will be required to inform the decision as to whether a new or updated EIA is required:

- The baseline condition of the environment just before decommissioning activities take place, to be informed by findings of environmental monitoring and asset/engineering monitoring previously completed;
- A review of any relevant new or updated legislation, policy or guidance;
- Other marine users that are likely to be impacted by the decommissioning of the Development;
- Amenities, activities and future uses of the environment;
- Historic environment interests; and
- Seascape and landscape interests.

If required, then the decommissioning EIA would fill any information gaps in relation to these issues and would also describe the measures envisaged to avoid, reduce and, if possible, remedy any likely significant adverse impacts arising from the decommissioning process.

7 COSTS

The decommissioning cost information required by DECC guidance (DECC, 2011) will be provided to Scottish Ministers in confidence in an appendix as part of the DP submitted for approval.

8 FINANCIAL SECURITY

In accordance with the terms of the seabed lease, a financial security has been provided to The Crown Estate (TCE) to cover the costs of any failure of AOWFL to decommission the assets at the end of the operational life.

The financial security is in the form of a Parent Company Guarantee provided by Vattenfall AB (Publ), which is owned by the Swedish state. The guarantee expires on the earlier of 25th October 2047 or 5 years after receipt of a decommissioning certificate. This financial security will be provided to Scottish Ministers in confidence in Appendix B.

9 SCHEDULE

A full decommissioning schedule will be provided closer to the time of decommissioning. The schedule will set out a detailed plan of the proposed decommissioning works for consultation with the relevant authorities and for approval by the Scottish Ministers.

Currently, it is proposed that full decommissioning of the development will commence 22 years after commissioning of the Development, to coincide with the end of the design life of the WTGs and the consented period.

The duration of the decommissioning phase is estimated to be up to five months to complete although the final duration and programme of the decommissioning works will be provided in the final DP prior to the start of decommissioning.

10 PROJECT MANAGEMENT AND VERIFICATION

AOWFL intends to undertake internal reviews of the DP throughout the lifetime of the project. Once the Development is nearing the end of its agreed 22-year operational period, AOWFL 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 20 after final commissioning of the Development.

Following completion of the decommissioning works, it is anticipated that a Decommissioning Report will be submitted to the Scottish Ministers. In accordance with the current DECC guidance (DECC, 2011) the decommissioning report will include:

- Confirmation that decommissioning has been carried out in accordance with the approved DP or an explanation of any major variances from the programme;
- Information on the outcome of decommissioning, including confirmation of seabed clearance;

- Confirmation that appropriate bodies have been notified of removal and of any remains;
- Confirmation that appropriate aids to navigation have been installed, where required, for any remains of installations which protrude above the sea-bed and are considered to be a danger to navigation; and
- Information on the actual costs of decommissioning and an explanation of any major variances from forecast costs.

Once the report has been submitted to and approved by the Scottish Ministers, AOWFL will endeavour to make it publically available.

11 SEABED CLEARANCE

In line with the details provided above, AOWFL is committed to covering the costs required to decommission the Development and ensuring the seabed has been cleared. Where necessary, upon completion of the decommissioning works a survey will be undertaken to ensure that all debris related to the decommissioning works 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. The process of collecting and presenting evidence that the site is cleared is required by the DECC guidance to be independent of AOWFL. AOWFL therefore proposes that an independent survey company will be commissioned to complete the surveys and that they will report in parallel to both AOWFL and the Scottish Ministers.

The required survey area would be determined during the decommissioning phase of the project, taking into account good practice at the time and the views of stakeholders. It is anticipated that the survey area would focus around the renewable energy installations i.e. the jacket substructure locations, assuming that the inter-array and export cables will be left in-situ. AOWFL 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 Aberdeen installations, AOWFL 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 the main decommissioning vessel would operate).

Analysis of any survey data gathered will also ensure that items for removal and disposal relate only to the Development. Consultation with relevant stakeholders will be conducted by Scottish Ministers in the event that other anomalies of archaeological interest are identified during the survey.

12 RESTORATION OF THE SITE

AOWFL is committed to restoring the Development area, as far as is reasonably practicable, to the condition that it was in prior to construction of the Development. Consistent with the decommissioning provisions detailed above, the key restoration work will relate to ensuring that components left *in-situ* (if any) are adequately buried, otherwise protected, or marked.

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

13 POST-DECOMMISSIONING MONITORING, MAINTENANCE AND MANAGEMENT

In the event that AOWFL fully remove the entire Development infrastructure, it is not anticipated that any post-decommissioning monitoring, maintenance or management activities will be required.

In the event that the cables or any other items (for instance scourprotection) are left in-situ, relevant stakeholders will be consulted as to the requirements for monitoring, maintenance and management following the decommissioning process.

14 SUPPORTING STUDIES

AOWFL (2011) European Offshore Wind Deployment Centre Environmental Statement. Available from < http://marine.gov.scot/datafiles/lot/eowdc/EOWDC_Aberdeen_Bay_EIA.pdf>

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AOWFL (2017) Cable Laying Strategy (EOWDC Document Reference Number ABE-ENV-DB-0003).

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APPENDIX A – NATURE CONSERVATION DESIGNATIONS

Table 10 - Designated Sites Considered in the EOWDC EIA

Site	Approximate Distance from EOWDC (km)	Qualifying Features
Special Areas of Conservation (SACs)		
River Dee SAC	7.5	Freshwater pearl mussel Atlantic salmon European otter
Sands of Forvie SAC	7.2	Embryonic shifting dunes Shifting dunes with marram Decalcified fixed dunes with crowberry Humid dune slacks
Buchan Ness to Collieston SAC	12.2	Vegetated sea cliffs
River South Esk SAC	63	Atlantic Salmon Freshwater pearl mussel
Firth of Tay and Eden Estuary SAC	96	Common seal Estuaries Intertidal mudflats Intertidal sandflats Subtidal sandbanks
Isle of May SAC	119	Grey seal Reefs
Moray Firth SAC	150	Bottlenose dolphin Submerged sandbanks
Berwickshire and North Northumberland Coast SAC	150	Grey seal Large shallow inlets and bays Partially submerged mudflats and sandflats Reefs Submerged or partially submerged sea caves
Special Protection Areas (SPAs)		
Ythan Estuary dSPA	OECC is within the dSPA.	Sandwich tern Little tern
Ythan Estuary, Sands of Forvie and Meikle Loch SPA (and Ramsar)	7.2	Pink-footed goose Sandwich tern Common tern Little tern Eider Redshank Lapwing
Buchan Ness to Collieston SPA	9.5	Fulmar Shag Kittiwake Herring gull Guillemot
Loch of Skene SPA (and Ramsar)	21	Whooper swan Greylag goose
Fowlsheugh SPA	31.1	Kittiwake Guillemot Fulmar Herring gull Razorbill

Site	Approximate Distance from EOWDC (km)	Qualifying Features
Loch of Strathbeg SPA (and Ramsar)	47.6	Sandwich tern Whooper swan Pink-footed goose Barnacle goose Greylag goose Teal
Montrose Basin SPA (and Ramsar)	63	Greylag goose Knot Pink-footed goose Redshank Dunlin Oystercatcher Eider Widgeon Shelduck Redshank
Troup, Pennan and Lion's Heads SPA	74.3	Fulmar Kittiwake Guillemot Herring gull Razorbill Seabird assemblage
Firth of Tay and Eden SPA (and Ramsar)	96	Marsh harrier Little tern Redshank Pink-footed goose Greylag goose Cormorant Shelduck Eider Long-tailed duck Common scoter Velvet scoter Goldeneye Red-breasted merganser Oystercatcher Grey plover Sanderling Dunlin Black-tailed godwit
Forth Islands SPA	124.4	Arctic tern Roseate tern Common tern Sandwich tern Northern gannet European shag Lesser black-backed gull Atlantic Puffin Razorbill Guillemot Fulmar Seabird assemblage

Site	Approximate Distance from EOWDC (km)	Qualifying Features
Firth of Forth SPA	134	Red-throated diver Slavonian grebe Golden plover Bar-tailed godwit Sandwich tern Pink-footed goose Shelduck Knot Redshank Turnstone Great-crested grebe Cormorant Scaup Eider Long-tailed duck Common scoter Velvet scoter Goldeneye Red-breasted merganser Oystercatcher Ringed plover Grey plover Dunlin Curlew Widgeon Mallard Lapwing
Fair Isle SPA	298	Arctic skua Arctic tern Fair Isle wren Fulmar Gannet Great skua Guillemot Kittiwake Puffin Razorbill Shag Seabird assemblage

APPENDIX B – FINANCIAL SECURITY

Commercial in Confidence