Hywind Scotland Pilot Park Project
EIA Scoping Report
Statoil Wind Limited (SWL)

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Integrated Services
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EIA Scoping Report

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STATOIL WIND LIMITED - REQUEST FOR SCOPING OPINION

Statoil Wind Limited (SWL) is seeking an Environmental Impact Assessment (EIA) Scoping Opinion for the Hywind Scotland Pilot Park Project from Marine Scotland on behalf of Scottish Ministers under Section 13 of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended). SWL is also requesting a Scoping Opinion from Aberdeenshire Council under Section 14 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 as part of submission of a voluntary EIA for the onshore components of the Project.

Comment is also sought and welcomed from other stakeholders with an interest in the proposed Project.

This Scoping Report and accompanying navigational Preliminary Hazards Assessment (PHA) have been produced by Xodus Group (Xodus) and Anatec respectively in line with relevant guidance and recent consultation with Marine Scotland, Aberdeenshire Council, its advisory bodies and other key stakeholders. A description of the proposed Project along with SWL's proposed approach to the EIA and Navigational Risk Assessment (NRA) is provided.

Further queries relating to the Project should be directed to:

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Table of Contents

STATOIL WIND LIMITED - REQUEST FOR SCOPING OPINION III

1 INTRODUCTION 9

1.1 Introduction to Statoil Wind Limited 9
1.2 Definitions 9
1.3 Background to the Project 10
1.4 Overview of the Project 10
1.5 Consenting strategy 11
1.6 Document purpose 12
1.7 Document structure 12

2 PROJECT DESCRIPTION 15

2.1 Introduction 15
2.2 Site selection process 15
2.3 Selected site 15
2.4 Project timescale 16
2.5 The Hywind Scotland WTG Unit 16
2.6 Pilot Park components – offshore 20
2.7 Onshore components applicable to the Pilot Park 22
2.8 Construction phase 23
2.9 Operational phase 25
2.10 Decommissioning phase 27

3 POLICY AND LEGISLATION FRAMEWORK 28

3.1 The need for renewable energy 28
3.2 Energy and climate change policy 28
3.3 Marine planning framework (policy, consenting and licensing) 28
3.4 Terrestrial planning framework (policy, consenting and licensing) 30
3.5 Environmental Impact Assessment legislation (marine and terrestrial) 30
3.6 Nature conservation (including HRA and European Protected Species) 31
3.7 Guidance and best practice 31

4 STAKEHOLDER ENGAGEMENT 32

4.1 Approach to stakeholder engagement 32
4.2 Stakeholder engagement strategy 32
4.3 Pre-scoping consultation 34
4.4 Stakeholder identification 34
4.5 Public consultation 35
4.6 Consultation beyond application submission 35

5 APPROACH TO SCOPING AND EIA 36

5.1 Introduction 36
5.2 EIA Process 36
5.3 Approach to preparation of this Scoping Report 38

6 ORNITHOLOGY 40

6.1 Assessment strategy 40
6.2 Baseline environment – desk based study 41
6.3 Baseline environment – commissioned surveys and data analysis 43
6.4 Data and information gaps 43
6.5 Identification of potential impacts 44
6.6 Approach to assessment of potential impacts 44

7 BENTHIC AND INTERTIDAL ECOLOGY 47

7.1 Assessment strategy 47
7.2 Baseline environment – desk based study 47
7.3 Baseline environment – commissioned surveys and data analysis 49
7.4 Data and information gaps 49
7.5 Identification of potential impacts 49
7.6 Approach to assessment of potential impacts 51

8 FISH AND SHELLFISH ECOLOGY 52

8.1 Assessment strategy 52
8.2 Baseline environment – desk based study 52
8.3 Baseline environment – proposed surveys and data analysis 54
8.4 Data and information gaps 54
8.5 Identification of potential impacts 54
8.6 Approach to the assessment of impacts 56

9 MARINE MAMMALS AND TURTLES (INCLUDING MARINE NOISE) 57

9.1 Assessment strategy 57
9.2 Baseline environment – desk based study 58
9.3 Baseline environment – proposed surveys and data analysis 61
9.4 Data and information gaps 61
9.5 Identification of potential impacts 61
9.6 Approach to the assessment of potential impacts 63

10 PHYSICAL PROCESSES AND SEDIMENT DYNAMICS 66

10.1 Assessment strategy 66
10.2 Baseline environment – desk based study 67
10.3 Baseline environment – proposed surveys and data analysis 70
10.4 Data and information gaps 70
10.5 Identification of potential impacts 70
10.6 Approach to the assessment of impacts 71

11 SEDIMENT AND WATER QUALITY 73

11.1 Assessment strategy 73
11.2 Baseline environment – desk based study 73
11.3 Baseline environment – proposed surveys and data analysis 74
11.4 Data and information gaps 74
11.5 Identification of potential impacts 74
11.6 Approach to assessment of potential impacts 75

12 MARINE AIR QUALITY AND CLIMATE 77

12.1 Assessment strategy 77

13 COMMERCIAL FISHERIES 78

13.1 Assessment strategy 78
13.2 Baseline environment – desk based study 78
13.3 Baseline environment – consultations and further data analysis 80
13.4 Data and information gaps 81
13.5 Identification of potential impacts 81
13.6 Approach to assessment of potential impacts 82

14 SHIPPING AND NAVIGATION 84

14.1 Assessment strategy 84
14.2 Baseline environment – desk based study 84
14.3 Baseline environment – proposed surveys and data analysis 85
14.4 Data and information gaps 85
14.5 Identification of potential impacts 85
14.6 Approach to assessment of potential impacts 86

15 MARINE ARCHAEOLOGY AND CULTURAL HERITAGE 87

15.1 Assessment strategy 87
15.2 Baseline environment – desk based study 87
15.3 Baseline environment – commissioned surveys and data analysis 88
15.4 Data and information gaps 88
15.5 Identification of potential impacts 89
15.6 Approach to assessment of potential impacts 89

16 MILITARY, AVIATION AND RADAR, AND UNEXPLODED ORDNANCE 91

16.1 Assessment strategy 91
16.2 Baseline environment – desk based study 91
16.3 Baseline environment – proposed surveys and data analysis 93
16.4 Data and information gaps 93
16.5 Identification of potential impacts 93
16.6 Approach to assessment of potential impacts 94

17 OTHER SEA USERS 96

17.1 Assessment strategy 96
17.2 Baseline environment – desk based study 96
17.3 Data and information gaps 97
17.4 Identification of potential impacts 98
17.5 Approach to assessment of potential impacts 98

18 SOCIO-ECONOMICS 100

18.1 Assessment strategy 100
18.2 Baseline environment – desk based study 100
18.3 Data and information gaps 100
18.4 Identification of potential impacts 100
18.5 Approach to assessment of potential impacts 102

19 ONSHORE EIA TOPICS 103

19.1 Introduction 103
19.2 Onshore EIA topics 103
19.3 Baseline environment – collecting baseline data and information 103
19.4 Seascape, landscape and visual impact assessment 105
19.5 Terrestrial ecology 107
19.6 Onshore archaeology and cultural heritage 109
19.7 Traffic and transport 111
19.8 Onshore noise 113
19.9 Local air quality (onshore) 115
19.10 Public space and amenity 116

20 CUMULATIVE AND IN-COMBINATION EFFECTS 118

20.1 Introduction 118
20.2 Projects to be considered for cumulative and in-combination impacts 118

21 HRA STRATEGY 122

21.1 Introduction 122
21.2 Proposed HRA Strategy 122
21.3 Overview of the HRA process 122
21.4 Approach to carrying out the HRA 124

22 CONCLUSIONS 127

23 REFERENCES 131

24 GLOSSARY OF TERMS 136

25 ACRONYMS 138

APPENDIX A HYWIND SCOTLAND – POTENTIAL ANCHOR ALTERNATIVES 140

APPENDIX B STAKEHOLDER LIST 142

APPENDIX C PRELIMINARY HAZARD ANALYSIS 146

APPENDIX D MARINE NOISE DESK STUDY 147

1 INTRODUCTION

1.1 Introduction to Statoil Wind Limited

Statoil Wind Limited (SWL) was incorporated on 19 February 2009 (on the 6 November the company name was changed from StatoilHydro Wind Limited). The ultimate parent company is Statoil ASA, which is incorporated in Norway, of which the ultimate controlling party is the Norwegian government. Statoil ASA is the second largest supplier of natural gas to the European market, with a market share of approximately 14%. The main delivery points into the UK are at Easington and St Fergus. Statoil ASA is responsible for the majority of the technical operations used in the processing and transportation of Norwegian natural gas.

The principal activity of SWL is the development of renewable energy projects in the United Kingdom. The company currently owns 25% of Forewind Limited, a company whose sole purpose is the development of offshore wind farms situated in the Dogger Bank zone off the eastern coast of England.

1.2 Definitions

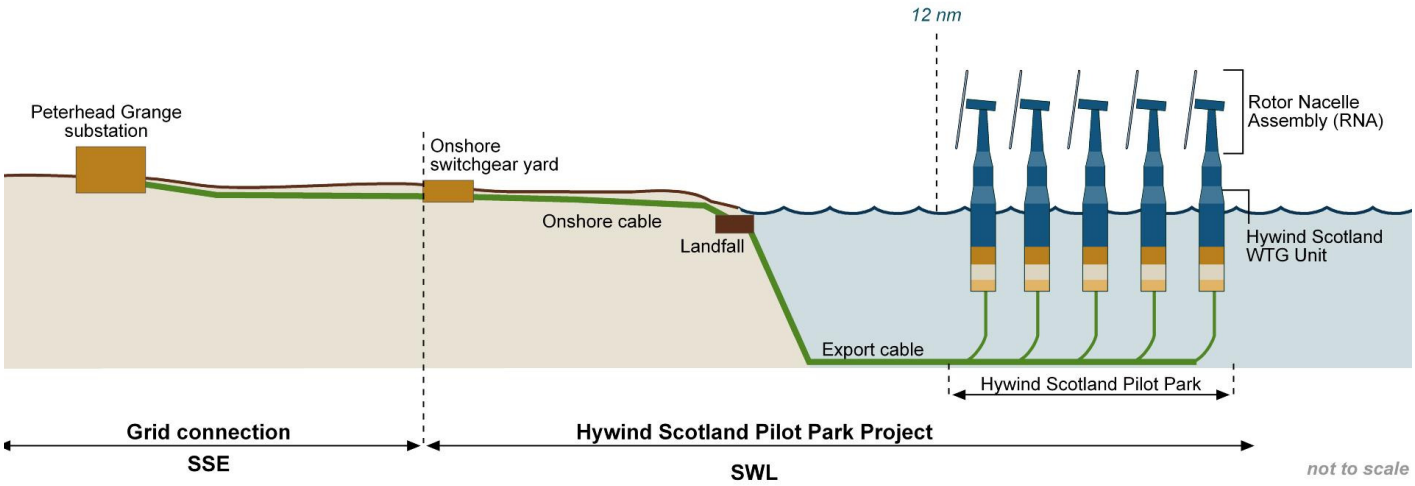
Within the context of this Scoping Report, the following definitions and terms apply when discussing the Project and components of the Project:

- **Hywind Scotland Pilot Park Project (the Project)**: The entire pilot park project, including all onshore and offshore components of the project, and all project phases from project development to decommissioning.
- **Hywind Scotland Pilot Park (Pilot Park)**: Term that refers to the physical components of the Project that will be located within the proposed AfL Area. This includes the five WTG Units and all associated infrastructure e.g. inter-array cables.
- **Hywind Scotland Exclusivity Area (Exclusivity Area)**: This is the offshore area of seabed awarded to SWL by The Crown Estate (TCE) under the terms of an Exclusivity Agreement for the deployment of the demonstration floating wind turbines.
- **Proposed Area for Agreement for Lease (proposed AfL Area):** SWL is in discussions with TCE for the granting of an Agreement for Lease for a revised area as shown on Figure 1.2. The northern and southern areas under the Agreement for Lease would be smaller than the Exclusivity Area apart from the northern edge which would be extended by 1,000 m in a northerly direction. The decision on which part of the proposed Agreement for Lease area will be developed (north or south) and the final location of the demonstration Hywind Scotland Pilot Park will be determined following surveys and on-going engineering and environmental studies.
- **Hywind Scotland Wind Turbine Generator Unit (WTG Unit):** The WTG Unit intended to be used for the Hywind Scotland Pilot Park Project, i.e. a 5 - 6 MW turbine with a purpose-designed Hywind floating support structure and mooring system. In temporary construction phases (prior to installation), or decommissioning phases, however, the phrase 'WTG Unit' is utilised to denote the system without the full mooring and export/array cable systems attached.
- **Hywind Demonstration (Hywind Demo):** SWL's full-scale prototype of the Hywind concept, installed outside Karmøy, Norway in 2009, and carrying a 2.3 MW Siemens Wind Turbine Generator (WTG).
- **Rotor – Nacelle Assembly (RNA):** Part of an offshore wind turbine carried by the support structure.
- **Export cable:** Cable for transporting electricity from the Pilot Park to the landfall at Peterhead.
- **Export cable route corridor:** Corridor within which the export cable from the Pilot Park will be located.
- **Landfall:** This is where the export cable will be brought ashore.
- **Landfall area of search:** Area within which the landfall will be located.
- **Onshore cable route corridor:** Area within which the onshore cable route will be located.

> **Onshore switchgear yard:** The onshore yard that could include such items as; building(s)/enclosure(s), switchgear, control, communication and protection equipment, reactive compensation equipment (as necessary) and in the event of the Project involving installation of a 66 kV export cable, power transformer(s).

Key components of the Project described above are illustrated in Figure 1-1.

Figure 1-1 Key components of the Hywind Scotland Pilot Park Project



1.3 Background to the Project

As part of their offshore wind portfolio, SWL has invested in the development of the Hywind floating offshore Wind Turbine Generator (WTG) Unit, a concept that represents the world's first full scale floating wind turbine. A full-scale demonstration WTG Unit (Hywind Demo) has been successfully in operation 10 km off the Norwegian west-coast since 2009. During the four years of testing, the WTG Unit has been verified as a technically viable concept and SWL is now planning to develop a Pilot Park which will be used to demonstrate technological improvements, operation of multiple units, and cost reductions in a park configuration as the next step towards achieving the long term vision for developing floating wind on a commercial scale.

1.4 Overview of the Project

SWL has been awarded an Exclusivity Agreement by The Crown Estate (TCE) for the deployment of floating WTG Units in an area known as the Buchan Deep which is an area of deep water (95 to 120 m) located approximately 25 km off the coast at Peterhead, north east Scotland just outside the 12 nm territorial water limit (Figure 1-2). SWL is planning to deploy a small pilot wind farm (Pilot Park) comprising five of the Hywind Scotland WTG Units with a total maximum nameplate capacity of up to 30 MW.

The Exclusivity Area is split into a northern and a southern part by the Forties to Cruden Bay pipelines which pass through the Exclusivity Area from north east to south west. The Pilot Park will be located either to the north or south of these pipelines. Electricity generated from the Pilot Park will be exported onshore to the local grid network via a new export cable to Peterhead.

It should be noted that SWL are currently in the process of identifying an area based on the Exclusivity Area that will form the basis of their application to the TCE for an Agreement for Lease (AfL). One of the options under consideration as the AfL is illustrated in Figure 1-2 (proposed AfL Area). However, given that this proposed AfL Area is still subject to agreement with TCE and the grant of seabed rights, and extends 1,000 m beyond the northern boundary of the Exclusivity Area, all references in this Scoping Report will be made to both the Exclusivity Area and the proposed AfL Area.

The WTG Units are expected to have a hub (centre) height between 82 and 101 m above Mean Sea Level (MSL), with a draft of between 70 to 85 m and a rotor diameter of 120 to 154 m. The WTG Units will be positioned approximately 720 to 1,600 m apart. The WTG Units will be attached to the seabed by a three-point mooring spread. The anchor types currently under consideration are drag embedded (fluke or plate), torpedo, suction embedded plate anchors, suction anchors and gravity anchors. Three anchors (or possibly six – see section 2) will normally be required per WTG Unit. The mooring lines are likely to be composed of combinations of wire and chains and possibly synthetic fibre rope, and may include the use of clump weights and/or buoyancy elements. The radius of the mooring systems extending out from each of the WTG Units will be between 600 to 1,200 m.

The WTG Units will be connected by inter-array cables which may require anchoring in some locations. The static part of the export cable, which will transport electricity from the park to the shore at Peterhead, is likely to be buried. Both the inter-array and export cable will have 33 kV (or 66 kV) transfer voltage.

The export cable is planned to come ashore at Peterhead and connect to the local distribution network at Peterhead Grange Substation.

In addition to the proposed AfL Area and associated onshore and offshore infrastructure, the Hywind Scotland Pilot Park Project will use a deep water inshore area, the location of which is still to be determined, to assemble the WTG Units prior to installation. Once assembled, the WTG Units will be towed in an upright position from the assembly point to the Buchan Deep.

SWL aims to begin onshore construction in 2015 / 2016 followed by offshore construction in 2016 / 2017. This will allow for final commissioning of the Pilot Park in 2016 / 2017.

1.5 Consenting strategy

The proposed consenting strategy for the Hywind Scotland Pilot Park Project has been developed in discussion with Marine Scotland and Aberdeenshire Council and reflects advice provided in their formal screening responses which were issued on 14th August 2013 and 19th July 2013 respectively.

As part of Environmental Impact Assessment (EIA) screening it was confirmed that a Marine Licence is required for the offshore components of the Project under the Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009. Planning permission under the Town and Country Planning (Scotland) Act 1997 is also required for the onshore components of the Project.

To support the Marine Licence application, SWL is required to carry out an EIA under the Marine Works (Environmental Impact Assessment) Regulations 2007 in order to determine whether there is potential for the Project to have any adverse effects on the environment. However, it has been determined by Aberdeenshire Council that the onshore components do not require an EIA under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (Aberdeenshire Council, 2013).

Nevertheless, given that onshore works form an integral part of the overall Hywind Scotland Pilot Park Project it is intended that both the onshore and offshore components of the Project are considered in the EIA and written up in the Environmental Statement (ES). The ES will then be submitted voluntarily to Aberdeenshire Council as part of the planning application for the onshore works.

The ES will also include consideration of navigational issues via a Navigational Risk Assessment (NRA). Section 3 provides more detail on the policy and legislation relevant to the Project.

Section 36 Consent (under the Electricity Act 1989) is not required for the Hywind Scotland Pilot Park Project on the basis that the Project is located outwith territorial waters (12 nm) and is below the 50 MW capacity threshold for marine based generating stations in the offshore area (12 to 200 nm) (Scottish Government 2013). Consequently the determination period for Project consent will be approximately 4 to 5 months for the Marine Licence rather than the 9 months required for a Section 36 application.

In addition to the Pilot Park, export cable route and associated onshore works, the Project also involves the off-site assembly of the WTG Units and towing of assembled WTG Units to the proposed AfL Area. Although the location of the assembly site is currently unknown, there is potential that it could be located off the west coast of Scotland at an existing suitable inshore, deepwater facility.

Activities at the assembly site will involve the upending and ballasting of the WTG Units followed by attachment of the RNA. Further detail about the assembly site and tow route is provided in Section 2. During the pre-scoping meeting with Marine Scotland, SHN, JNCC and Aberdeenshire Council held on 14th June 2013, it was identified that due to the nature of the assembly works proposed and geographical location of the assembly site in relation to the Pilot Park, activities at the assembly site could potentially require a separate Marine Licence. However, where assembly takes place at an existing facility it is expected that these activities will already be covered by necessary permits that will already be in place for the facility. This will be confirmed once the location of the assembly site has been identified.

1.6 Document purpose

This Scoping Report, and accompanying navigational Preliminary Hazards Assessment (PHA) has been prepared in order to support the development of the Hywind Scotland Pilot Park and represents a formal request for a Scoping Opinion from Marine Scotland and Aberdeenshire Council, in consultation with the relevant statutory consultees. The request for a Scoping Opinion from Marine Scotland is for the Pilot Park and export cable and all offshore infrastructure below mean high water springs (MHWS) and the request for a Scoping Opinion from Aberdeenshire Council is for the export cable onshore and grid connection works (all works above mean low water springs, MLWS).

The Scoping Report has been produced to facilitate the identification and initial assessment of the potential environmental impacts associated with the Project. It identifies the potential interactions there may be between the proposed Project and the environment in order to establish studies and/or surveys that might be required in order to better understand these interactions. Similarly, the aim of the PHA is to identify potential navigational hazards associated with the Project and determine, through consultation, how these hazards should be addressed as part of the NRA.

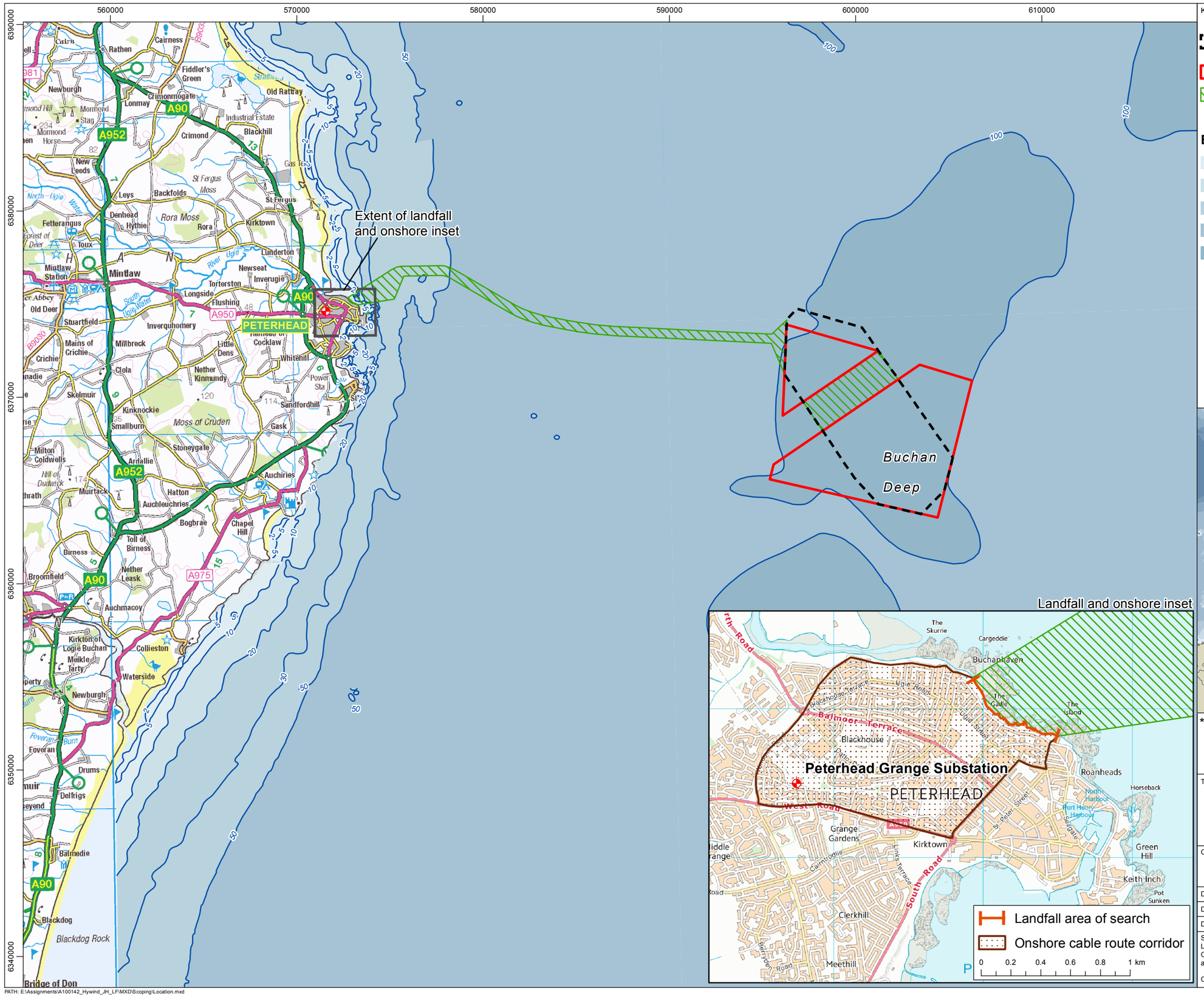
Scoping is one of the early stages of the EIA process (see Section 5). The EIA process identifies the areas of a Project where significant environmental effects may occur and outlines mitigation or management techniques aimed at reducing or offsetting these effects. SWL wishes to seek feedback and advice on any particular environmentally or socially important issues associated with the proposed Project, for which consideration will be required in the EIA and subsequent ES.

1.7 Document structure

Below is a summary of the structure and content of the following sections in the Scoping Report.

Section	Title	Description
Section 2	Project description	A detailed description of the proposed Project including device structures, timescales, technology and infrastructure.
Section 3	Policy and legislation framework	Summarises national, regional and local policies and legislation related to marine renewables.
Section 4	Stakeholder engagement	Summarises consultation undertaken during scoping and presents the overall proposed consultation strategy.
Section 5	Approach to Scoping and EIA	Describes an overview of the scoping and EIA process.
Sections 6 - 19	Impact baseline characterisation, proposed assessment strategy and potential impact identification	Describe the marine biological, marine physical, human and onshore environment in the proposed development area as well as describing the potential impacts, data gaps and EIA strategy.

Section	Title	Description
Section 20	Cumulative and in-combination effects	Considers the approach to the cumulative and in-combination assessment (CIA), key topics to be considered and projects to be included in the CIA.
Section 21	HRA strategy	Presents the proposed strategy for carrying out an HRA of the Hywind Scotland Pilot Park Project.

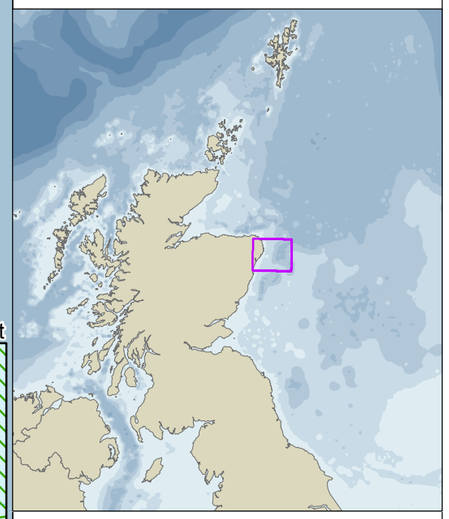


KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation

Bathymetry (m)

- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200



0 1 2 3 4 nm

0 2 4 6 8 km

N

TITLE:

Figure 1.2
Location of Hywind Scotland Pilot Park Project

CLIENT: Statoil

DATE: 30/09/2013	SCALE: 1:200,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: Location.mxd			A01

SOURCE: © Crown Copyright, 2013. All rights reserved.
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COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

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2 PROJECT DESCRIPTION

2.1 Introduction

The Hywind WTG Unit concept[1] represents the world's first full-scale floating wind turbine. SWL's concept for the Hywind Scotland WTG Unit was to create a floating wind turbine that can be operated in waters in excess of 100 m depth that is based on conventional technology and has a simple substructure design. In 2009 a full-scale demonstration WTG Unit (Hywind Demo) was installed 10 km off the Norwegian west-coast. This WTG Unit, which has been tested and operated successfully for the last four years, has been verified as a technically viable concept. In order to continue towards achieving the long term vision for developing floating wind on a commercial scale, SWL is planning to develop one (or more) pilot parks which will be used to demonstrate technological improvements, operation of multiple units, and cost reductions in a park configuration. Hywind Scotland is the first floating WTG Pilot Park to be taken forward for development.

2.2 Site selection process

Identification of a suitable location for development of a Hywind Scotland Pilot Park was influenced by a number of factors including:

- Water depth – the WTG Units require, in general, water depths of more than 95 to 100 m;
- Proximity to the grid – due to the relatively small scale of the Pilot Park (5 WTG Units) potential development sites need to be close to the coast in order to facilitate export of power to the local/national grid;
- Access to sheltered inshore deep water areas for WTG Unit assembly;
- Proximity to deep water navigation route – once assembled the WTG Units are towed in an upright position to the Pilot Park site. Therefore the navigation route between the inshore assembly area and Pilot Park site must be of sufficient water depth to accommodate the unit's towing draft; and
- Suitable seabed conditions – although the mooring system is not dependent of a specific type of anchor and therefore has no strict requirements in terms of seabed conditions, an even seabed, with sufficient soil above bedrock is preferred for the ease of installation.

SWL identified two locations in Scottish waters which met all or most of the criteria above. These potentially viable locations included an area in The Minch off Stornoway and the Buchan Deep off Peterhead. Identification of these areas was supported by high level constraint mapping and initial consultations with statutory consultees and some local stakeholders. Feedback from the conservation bodies at this early stage suggested that the risk to consenting may be less for the Buchan Deep location due to it being further offshore with less environmental sensitivity. The Buchan Deep site also offered better availability of grid connections and was therefore selected as the preferred development location.

SWL then carried out more detailed constraints mapping and stakeholder engagement for an area of search within the Buchan Deep to identify a preferred area for development (Figure 1-2). In 2011, SWL was awarded an Exclusivity Agreement by TCE for the deployment of floating WTG Units in an area of deep water (95 m to 120 m) located towards the southern end of the Buchan Deep, approximately 25 km east of Peterhead.

2.3 Selected site

The area for which SWL was awarded the Exclusivity Agreement is split into two parts (northern and southern) by the Forties to Cruden Bay pipelines which pass through the area from northeast to southwest. The Pilot Park will be located either to the north or south of a 500 m buffer that extends along these pipelines. SWL is in discussions with TCE for the granting of an Agreement for Lease (AfL) for a revised area as shown on Figure 1.2.

[1] Concept for a floating WTG Unit based on slender buoy (SPAR) technology.

The northern and southern areas under the proposed (AfL) Area would be smaller than the Exclusivity Area apart from the northern edge which would be extended by 1,000 m in a northerly direction. The decision on which part of the proposed AfL Area will be developed (north or south) and the final location of the WTG Units will be determined following surveys and on-going engineering and environmental studies

2.4 Project timescale

SWL aims to have the Hywind Scotland Pilot Park in operation by 2016/2017. This will be based on achieving the following key Project milestones:

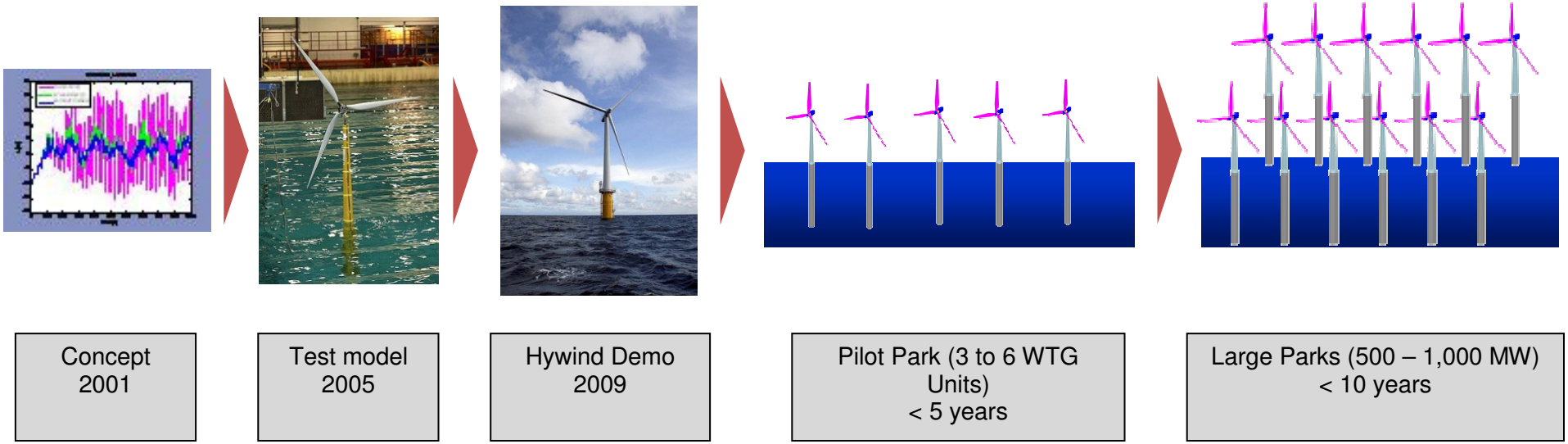
- Feasibility Phase completed : Oct 2013
- Concept Phase completed : Q2 2014
- EIA Submission : Q4 2014
- Final Investment Decision : Q1/2 2015
- Onshore construction : Q1/2 2015 to Q2/3 2016
- Offshore construction activities : Q1 2016 to 2017
- Final commissioning : Q4 2016 /Q1 2017

2.5 The Hywind Scotland WTG Unit

2.5.1 Concept development and testing

The Hywind WTG Unit concept has been developed by SWL over the last 10 years. The stages of development from the initial concept and theory in 2001, through to deployment of the Hywind Demo WTG Unit in 2009 and the future development of pilot parks and future larger scale commercial floating offshore wind farms are illustrated in Figure 2-1 below.

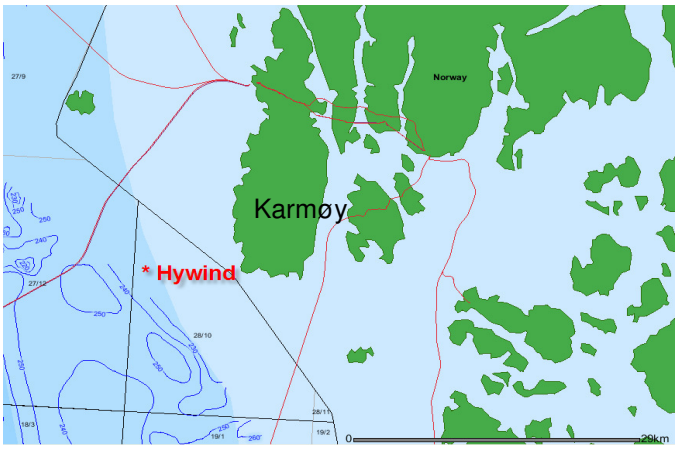
Figure 2-1 Hywind concept development



2.4.2 The Hywind Demo WTG Unit

Hywind Demo is a full-scale demonstration WTG Unit that was deployed 10 km off the island of Karmøy, north of Stavanger, in September 2009 (Figure 2-2). An export cable from the Hywind Demo WTG Unit comes ashore near Skudeneshavn at the southern end of Karmøy, where the local grid operator operates a receiving station. The main objective of the demonstration project was to test how wind and waves affect the WTG Unit. The information obtained will be used by SWL to commercialise the concept.

Figure 2-2 The Hywind Demo WTG Unit location (off the coast of Norway)



Based on the slender buoy (SPAR[2]) concept, the Hywind Demo WTG Unit consists of a steel tower and substructure filled with ballast water and solid ballast. The Hywind Demo, which is based on a standard 2.3 MW WTG solution, was designed for extreme North Sea conditions. The WTG Unit is fitted with a dynamic pitch regulation system to reduce the motion of the WTG Unit (Figure 2-3). The WTG Unit, including nacelle and rotors, was assembled at a sheltered site in inshore waters and towed upright to the deployment location. The technical details are summarised in Table 2-1.

Figure 2-3 The Hywind Demo WTG Unit

[2] A tall vertically floating slender cylindrical buoy with a large draft.

The Hywind Demo provided validation of the Hywind technology through the collection of full-scale measurements on motion control and electrical output. The actual movements of the WTG Unit confirmed the simulation model and indicated no negative impact on WTG Unit performance. The capacity factor was > 50% during 2011. Up to June 2013 the Hywind Demo demonstration project had produced over 30 GWh. The Hywind Demo model also allowed testing of access and inspection methods, which were confirmed as satisfactory.

Underwater noise monitoring undertaken for over four months during 2011 will contribute to an understanding of the noise generated by the WTG Unit and transmitted through the submerged parts of the WTG Unit into the water column. The results of this study will be utilised in understanding the noise aspects of the Hywind Scotland Pilot Park Project.

2.5.2 Design optimisation for Hywind Scotland

The experience gained during the Hywind Demo project allowed the design used for the Hywind Demo WTG Unit to be further developed and optimised for the Hywind Scotland WTG Unit which will be the WTG Unit deployed at the Hywind Scotland Pilot Park. The demonstrated stability and motion performance of Hywind Demo has allowed for the Hywind Scotland WTG Unit to have a reduced draft (shallower substructure) and house a larger rotor diameter (Table 2-1 and Figure 2-4a). Direct drive technology has also been introduced to reduce the top-head mass and reduce maintenance needs. A typical nacelle consists of the following main components; hub, main bearings, main shaft, generator and the base frame.

The colour of the Hywind Scotland WTG Unit will be decided in consultation with the appropriate authorities, but is likely to be pale grey with a semi-matt finish to blend in with the local seascape. For the purposes of navigational safety, the lower parts of the WTG Units (at sea level) will be painted yellow to provide increased visibility to shipping. Navigation and aviation lighting will also be installed.

The design specifications for Hywind Demo and Hywind Scotland WTG Units are summarised in Table 2-1. The specification for Hywind Scotland will provide the basis of the design envelope for the purpose of the EIA.

Table 2-1 Hywind specification

	Hywind Demo (demonstration WTG Unit)	Hywind Scotland WTG Unit (Hywind Scotland Pilot Park)
Turbine nameplate capacity	2.3 MW	Up to 6 MW
Approximate annual production per WTG Unit	7.6 - 10.1 GWh (actual)	15 - 30 GWh (Predicted)
Hub height	65 m	Maximum 101 m above MSL
Rotor diameter	82 m	Maximum 154 m
WTG Unit height to tip of rotor blade	105 m	Maximum 178 m
Operational Draft	100 m	70 – 85 m
Approx. top head mass (rotor + nacelle)	138 tons	310 – 400 tons
Displacement	5,300 m^3	Approx. 12,500 m^3
Operating water depths	120 – 700 m	95 – 700 m
Air gap (MSL to blade tip)[Note 1]	24m	Minimum 20 m
Spacing between WTG Units	N/A	720 – 1,600 m
Mooring lines – radius from centre	Approx. 800 m (Site specific)	600 m to 1,200 m
Note 1: The Hywind Scotland WTG Unit will be a floating structure that will rise and fall with the tide. The air gap will therefore generally remain relatively constant irrespective of tide heights.		

Figure 2-4a Hywind Demo and Hywind Scotland WTG Unit

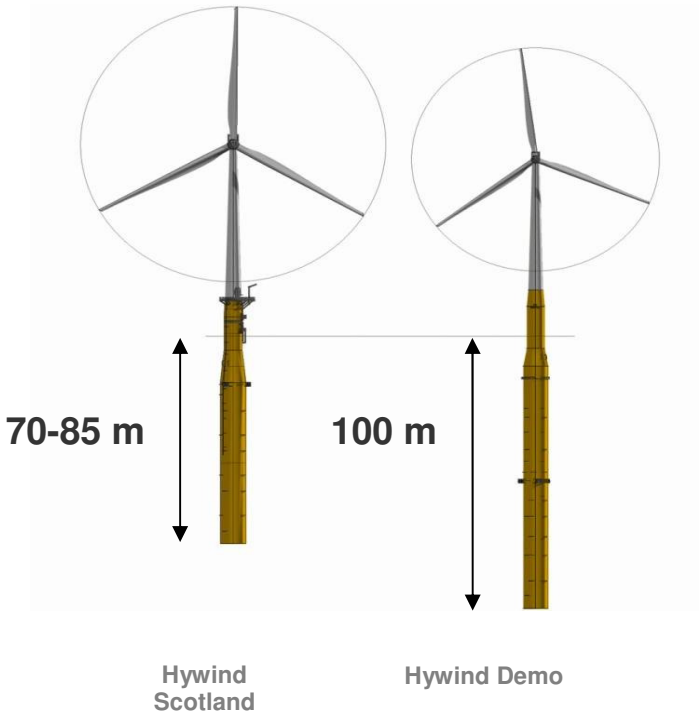
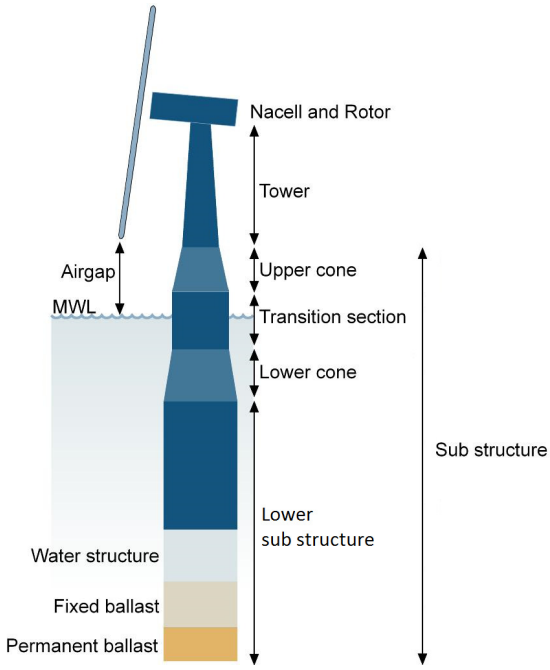


Figure 2-4b Hywind Scotland WTG Unit Design



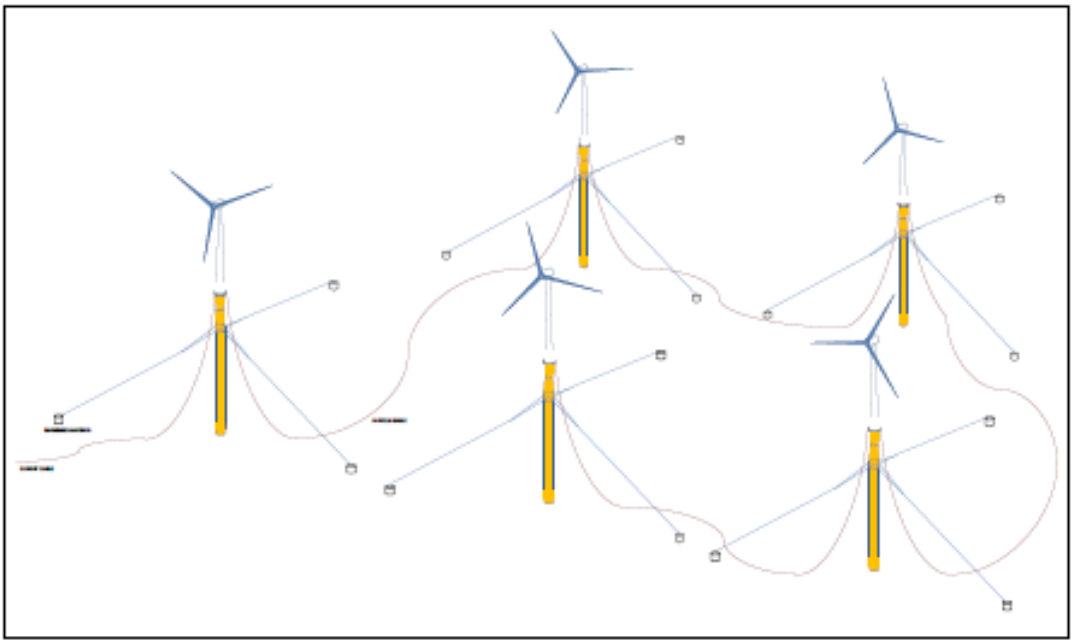
2.6 Pilot Park components – offshore

2.6.1 WTG Unit layout and moorings

The 30 MW (maximum nameplate capacity) Pilot Park will consist of 5 turbines, each of which will be up to 5 to 6 MW in size. The WTG Units will be located between 720 m and 1,600 m apart and will be attached to the seabed by a three-point mooring spread (illustrated in Figure 2-5). Each point in this mooring system may use one or more anchors installed in parallel, or in series (piggy-backed one behind the other), resulting in three to six anchors installed per WTG Unit. The final number of anchor points will be decided pending geotechnical surveys planned first half of 2014). Depending on seabed conditions, the moorings will be secured with the most suitable type of anchor. The anchor types currently under consideration include drag embedded (fluke) anchors, torpedo anchors, SEPLA, suction anchors or weight anchors (See Appendix A). The mooring lines are likely to be composed of chains and wire, and possibly synthetic fibre rope, with clump weights (and/or buoyancy elements) attached. The mooring radius is expected to be in the range of approximately between 600 m – 1,200 m.

The total area that will be occupied of the Pilot Park including the mooring system is expected to be approximately 17.5 km^2 maximum. The exact size of the Pilot Park area will be dependent on the actual spacing and location of the anchors and mooring lines.

Figure 2-5 **Illustration of WTG Unit moorings and layout**



2.6.2 Inter-field and export cables

The WTG Units will be connected by inter-array cables. These cables will exit/hang-off the WTG Units and lie on the seabed (i.e. they are not expected to be buried). The inter-array cables could be arranged in either an open circuit as illustrated in Figure 2.5 above or a closed loop circuit where the inter-array cable will connect the last WTG Unit to the first WTG Unit to ensure export redundancy should any of the WTG Units be taken out of operation**.** The static part of the export cable, which will transport electricity from the park to the shore at Peterhead, is likely to be buried. In the base case inter-array and export cables will all be AC transmission with a 36 kV rating and 33 kV transfer voltage, however if technology allows, a 66kV solution could be an option. All infield cables and export cable will have the same voltage, and there will be no separate offshore substation.

2.6.3 Antifouling and corrosion

The corrosion protection of the external underwater substructure shall be a combination of cathodic protection and coating. The external structure above the waterline (upper part of substructure and turbine tower) will be coated. Internal ballast tank(s) may be coated or uncoated. Corrosion inhibitors (such as biocides) may be utilised for protection against micro-biological corrosion in the ballast compartment(s).

2.6.4 Diesel generators (temporary)

During tow to site, hook-up and offshore commissioning a small portable diesel generator may be required, e.g. to provide power to WTG systems, cranes and tools. During low wind periods the WTG Units can draw necessary internal power from the onshore grid through the export cable (when connected). The WTG Units have their own emergency power supply based on battery powered UPS's, but if grid connection is lost for a prolonged period of time (e.g. damaged export cable) a portable diesel generator will be required to be installed on the WTG Units.

2.6.5 WTG transformers

Depending on the WTG supplier, the WTG Unit transformer may be a liquid filled transformer. The transformer fluid will be bio-degradable with a high fire point[3] that is suitable for offshore wind farms.

2.7 Onshore components applicable to the Pilot Park

2.7.1 Cable landfall location

The exact location of the landfall (point at which the export cable will be brought ashore) is still to be identified. Amongst others, such location is dependent upon onshore geotechnical investigations and constraint mapping. It is expected however, that the landfall will be located along the coast to the north of Peterhead in the area defined as the landfall area of search (Figure 1-2).

The preferred method for bringing the cable ashore will be horizontal directional drilling (HDD) from an area behind the existing seawall. However, open trenching could be an option dependent upon the physical and environmental characteristics of the selected landfall location.

2.7.2 Onshore cable route

Once the cable has been brought ashore, the preferred method of installation will be to install the cable within the existing road network (or other non-'green-field' areas) using open trench cable burial techniques. The final onshore cable route will be selected once the landfall location and method of seawall area transit have been identified. However, the onshore cable route is not expected to be more than 3 km in length.

2.7.3 Onshore grid connection

The location of the onshore grid connection is at the Peterhead Grange substation.

2.7.4 Onshore switchgear yard

As part of the Project it is expected that there will be a need for additional electrical infrastructure to be provided in a separate onshore switchgear yard which will be located along the onshore cable route. At present the preferred location for the onshore switchgear yard is close to the Peterhead Grange Substation, but the actual location may change depending on the outcome of land owner and environmental studies. The onshore switchgear yard could include such items as; building(s)/enclosure(s), switchgear, control, communication and protection equipment, reactive compensation equipment (as necessary) and in the event of the Project involving installation of a 66 kV export cable, power transformer(s). The onshore switchgear yard will not exceed 1 ha.

2.7.5 Wider transmission works

It is noted that wider transmission works may be required as a cumulative effect of the Hywind Project and other generator projects connecting into the transmission network. It is assumed however that these works are covered in a separate consent and not in the planning consent required for this Project and covered in this Scoping Report.

[3] Temperature at which a substance ignites.

2.8 Construction phase

2.8.1 Project locations

Staging site

The processes described in Sections 2.8.4 and 2.8.5 are supported by an onshore facility, in the following referred to as the 'staging site'. The staging site will be established at an existing onshore facility though, depending on chosen facility, retrofitting and upgrades to the facility may be necessary.

The staging site will be used as an onshore support base for operations going on at the WTG Unit assembly site, described below. It may be used for storage of; equipment, WTG components, mooring components, consumables and the bulk ballast for the Hywind WTG Unit substructures (see Figure 2-4b).

WTG Unit assembly site

The processes described in Sections 2.8.4 and 2.8.5 will take place at an inshore sheltered location in the following referred to as the 'assembly site'. The assembly site will need a minimum water-depth of around 75 to 85 m. At the assembly site approximately 8 – 15 anchors may be expected to be installed temporarily in the construction phase to moor floating vessels (construction barges, floating cranes etc.).

Floating storage site

At different stages of the construction phase, vessels, barges or other floating objects will need to be moored for different lengths of time. These area(s) will be designated as the temporary floating storage site(s). The area(s) will need a water depth of 10 – 50 m and an established anchorage(s) will be sought out for this purpose.

2.8.2 Fabrication and storage of substructure

The Hywind WTG Unit substructures (in the following referred to as the "substructures") will be fabricated at existing facilities. After fabrication, prior to upending, ballasting and assembly, they will be stored at existing facilities or temporarily moored at a suitable location.

2.8.3 Manufacturing of the WTG

WTG's will be manufactured and stored at the WTG vendors manufacturing facilities. After delivery they will be stored at the staging site or on a floating barge moored at the floating storage site until assembly of the Hywind WTG Units.

2.8.4 Upending and ballasting of substructure

After fabrication, prior to assembly, the WTG Unit substructures will be upended and ballasted. The upending process is a process where sea water is pumped into the substructure for it to float lower and upended (go from a largely horizontal orientation to a more vertical orientation). After upending the substructure is ballasted with permanent solid (bulk) ballast. A small amount of fixed ballast will have already been added to the WTG Unit substructure during fabrication to assist with the upending process.

In the upending process sea water is pumped into the substructure. In the subsequent ballasting process some of the sea water is pumped out (more than 50%) and replaced with permanent bulk ballast consisting of high density aggregate, slurry of iron ore, or, equivalent. The sea water that is pumped out will likely contain some residue from the bulk ballast.

The upending and ballasting operation will take place at the WTG Unit assembly site.

2.8.5 Assembly of Hywind WTG Units

After upending and ballasting of the WTG Unit substructure the tower and Rotor-Nacelle Assembly (RNA) will be mounted on the substructure. They may be mounted individually or as a single piece using a floating crane or specialist vessel. This process will in the following be referred to as the 'assembly process' of the WTG Units.

The assembly process will be performed at the WTG Unit assembly site. After the assembly process, the WTG Units will be commissioned to the extent possible/practical and stored at the assembly site awaiting tow to the offshore site.

In the assembly process sea-water is pumped out of the substructure. This sea-water will likely contain some residue of the bulk ballast.

2.8.6 Tow to site

After assembly at the deep water inshore location the WTG Units will be towed to the proposed AfL Area for deployment (including hook-up) and final commissioning. The WTG Units will be towed at a draft of between 60 and 80 m. If the chosen assembly site is located on the west coast of Scotland the WTG Units will be towed to the Pilot Park location around the north coast of Scotland (passing to the north of Orkney). The towing operation will be performed with two to four vessels, possibly varying the towing spread along the route by adding or removing assisting tugs. (For the Hywind Demo Project, three vessels were used with one main tug and two assisting tugs). The towing operation may be undertaken by one or two independent towing spreads. Such operation is anticipated to have a 8-12 day duration (from Assembly Site to proposed AfL Area) for each unit. It is anticipated that the towing operation will be performed using the upper end of the mooring lines that are connected to the WTG Units.

2.8.7 Mooring system installation

It is anticipated that the seabed mooring system will be pre-installed prior to inter-array cable installation and towing to the site of the preassembled WTG Units. The mooring installation method will be dependent on the chosen anchor type, but will for any type result in the anchor being installed on/under the seabed with a part of the chain lying on the seafloor with a retrieval system. For installation purposes, the retrieval system will most likely be either a buoy floating on the surface, a buoy restricted to floating approximately 10 m above the seabed for pick-up by ROV, or a pennant wire that can be retrieved using a grapple.

Anchor pull-in test loading may be required (dependent upon anchor type). In such case, in order to achieve the necessary anchors test load it may be necessary to install temporary (counter) anchors. Such anchors (and associated equipment) will be utilised only for the installation phase and will be removed when installation has been completed. One temporary anchor may be set, and retrieved, as part of the anchor installation operation for each permanent anchor that is installed.

Alternatively, and as necessary, if anchor load levels permit, pull-in test loading of the anchors may be undertaken by utilisation of one or more anchor handling vessels loading the anchors to their test load.

2.8.8 Mooring operation

After arrival at the proposed AfL Area each WTG Unit will be connected to the mooring system. It is likely that two to three vessels will be involved in the mooring operation.

2.8.9 Fabrication, storage and installation of power cable

The export cable will be manufactured at a cable manufactures facilities. From the facility (or other temporary storage location) it will be loaded onto a cable installation vessel and installed. If the cable is to be stored after manufacturing it is anticipated that this will be done onshore at the manufacturer's facility or floating on a barge at a floating storage site.

Export cable installation

It is anticipated that the export cable will be installed before the WTG Units are moored in the proposed AFL Area. The export cable will, most likely, be laid in a seaward direction from the landfall to the proposed AFL Area. The end of the cable will be wet-stored on the seabed with a retrieval system, possibly consisting of a buoy on the sea surface or just above the seabed.

The static parts of the export cable will be buried to approx. 1 m depth using a vessel with specialist cable burial equipment such as trenchers, ploughs or jetting. The final method of cable installation will depend on seabed conditions along the export cable route.

Infield cable installation

The infield cables may be installed before or after the WTG Units are moored at the proposed AFL Area. The infield cables will be installed from an installation vessel. As part of the infield cable installation the offshore end of the export cable will, most likely, be retrieved and connected to a WTG Unit. To stabilise the cables at their touchdown points, system such as anchors (e.g. weighted), sand-bags or rock dumping may be used. It is not anticipated that the infield cables will be buried although, dependent upon cable dynamics and layout considerations, certain parts of the cable may be buried.

2.8.10 Onshore construction works

An onshore compound area for the temporary, on-site storage of equipment, machinery (e.g. excavators), cable drums and trucks etc. required during onshore cable installation and substation connection workings is expected to be required. This is likely to be located near to the landfall or at a point near to the onshore cable route. A small temporary construction compound may also be required at the onshore switchgear yard. If horizontal directional drilling (HDD) is chosen to bring the cable underneath the seawall, a suitable area will be required for the drilling systems and equipment including; ancillary equipment and mud handling and stringing storage area. The duration of the onshore works (cable laying, construction of the onshore switchgear yard and grid connection) is to be determined in close cooperation with SSE.

2.9 Operational phase

The Pilot Park is expected to generate 75 - 150 GWh/year (depending upon the WTG selected). The planned life of the Pilot Park is a maximum of 25 years. After this period, the Pilot Park could be decommissioned, replaced or continue to operate, subject to appropriate consent(s).

Onshore and offshore cables shall be designed for the design life of the Project and will not be subject to planned replacement during the lifetime of the Project. Similar considerations are relevant to the mooring system and substructure.

The WTG Units will be connected to shore by fibre optic communication in the export cable bundle. This will ensure communication with the WTG Units and data transfer so that the WTG Units can be remotely controlled and monitored via the control and monitoring system(s). During normal operations the WTG Units will shut down according to predefined rules and algorithms related to wind speeds and error alarms. Manual control is available and will be used when needed (e.g. during service and maintenance). Operating modes are indicated in Table 2-2 below.

Table 2-2 Typical Hywind Scotland operating modes

Operating mode	Rotor – Nacelle Assembly (RNA) and blade conditions
Standstill due to low wind speed (below 3 - 5 m/s)	RNA in idling position. Blades will be pitched out of the wind, unlocked and free to idle. RNA yaw function is deactivated so that rotor is not necessarily turned up against the wind. Idle speed will not be so very appreciable.

Operating mode	Rotor – Nacelle Assembly (RNA) and blade conditions
Operational mode (typically 4 - 25 m/s)	RNA will be positioned against the wind and the rotor will be steadily working between 12 -16 RPM (However maybe as low as 5 RPM – dependent upon RNA make and model selected).
Standstill due to high wind speed (typically above 25 m/s)	Blades will be pitched out of the wind, unlocked and free to idle. RNA yaw function is activated so the rotor is turned in a favourable position towards the wind. Idle speed is slow, but may be noticeable (1 - 2 RPM).
Standstill due to maintenance (any wind condition)	Blades will be pitched and locked. RNA yaw function is deactivated.

2.9.1 Lubricants and liquids

The WTG Unit includes small quantities of liquids in the auxiliary systems for the following functions:

- Blade pitch (dependent on supplier);
- Cooling systems (possibly containing glycol);
- Lubrication;
- Transformer cooling oil (biodegradable) if oil cooled transformer is selected; and
- SF_6 gas[4], if gas insulated switchgear are selected.

Lubricants and liquids (including hydrocarbons) associated with the temporary generators will also be present at those times when the generators are installed on the WTG Units. Replacement of consumable liquids (e.g. fuel) associated with these temporary generators will be undertaken by supply vessel.

2.9.2 Maintenance activities

Maintenance and inspection activities will be performed after the WTG Unit in question has been shut down. Boarding of the units will be undertaken by boat or helicopter. Transfer of personnel by boat will be via the boat landing and ladders on the substructure, while the use of helicopter will hoist personnel directly onto the nacelle.

The WTG Units are expected to be serviced on an annual basis. Oil change will be performed at planned intervals for different systems (typical intervals is two to five years).

In addition to scheduled services it is assumed that the WTG Units on average will require ten unforeseen visits per year for corrective actions. Frequency of these corrective services will vary over the life time of the Project but in total could range 25 to 100 days per year. Exchange of large components could occur and some of these failures may (in extreme events) require a new nacelle or rotor. The WTG Units can be disconnected and towed to shore to allow more efficient working in sheltered waters if offshore lifts are hindered by waiting on weather. Offshore lifts would require a crane vessel, while the tow-in solution is foreseen to require tug boat(s), anchor handling vessel(s) and a crane vessel/barge. (The Pilot Park may/may not continue continuous operations in the situation where a WTG unit has been removed).

Inspections of infield and export cables, moorings and substructure will normally be performed at intervals of one to four years using vessels with Remote Operated Vehicles (ROVs). To allow for adequate inspection biofouling may also have to be removed from the substructure, cables and mooring lines.

[4] Sulphur hexafluoride

2.9.3 Safety

Each WTG Unit will be equipped with all required tools and safety gear for personnel protection, first aid, evacuation, fire fighting etc. to function as a stand-alone unit.

Each WTG Unit will be equipped with navigational lights for marine operations and aviation that will automatically turn on in the dark.

The Pilot Park will be marked on navigation charts.

2.10 Decommissioning phase

Decommissioning of the floating WTG Units will follow the same relative sequence as construction, but will occur in reverse. The mooring lines will be disconnected and the anchors removed from the seafloor (to the extent practically and environmentally sound, pending anchor type). The WTG Units will be towed back to a near shore location where they will be dismantled. The inter-array cables (unless buried) will be removed, while the offshore export cable is anticipated abandoned in place after decommissioning. The onshore cable is expected to be abandoned in place. The Project equipment installed at the onshore switchgear yard will be disconnected, dismantled and removed. It is anticipated that all objects abandoned on the seabed will be cut below mud-line or covered so as not to be a hazard to mariners.

3 POLICY AND LEGISLATION FRAMEWORK

This section provides a summary and overview of the international, UK, Scottish, regional and local planning policies and guidance which are directly relevant to the Hywind Scotland Pilot Park Project.

3.1 The need for renewable energy

The UK has committed to sourcing 15% of its total energy needs from renewable sources by 2020 under the 2009 Directive on Renewable Energy (2009/28/EC) including electricity, heat and transport. The UK and Scottish Governments have also made legally binding commitments through the Climate Change Act 2008 and the Climate Change (Scotland) Act 2009.

There are four key drivers for the shift in energy production to low carbon sources, including renewable energy, in the UK and Scotland which are:

- The need to tackle climate change;
- The need to secure energy supply;
- The need for new energy infrastructure; and
- The need to maximise economic opportunities.

3.2 Energy and climate change policy

The challenges of climate change, energy supply and security of supply are driving policy on renewable energy developments. There are now a significant number of national and international policies, strategies and regulations relating to climate change and the development of renewable energy in Europe, the UK and Scotland. The Hywind Scotland Pilot Park Project is designed as a significant step towards developing a full commercial scale floating wind turbine development. This will allow SWL to test and further develop the technology, including installation methods, WTG Unit design and design of the moorings and anchors. The Project will contribute up to 30 MW installed capacity from wind energy and will make a contribution to achieving these policy aims. The lessons learned in developing the Pilot Park can then be applied to developing a commercial scale project which will further contribute to achieving relevant International, European, UK and Scottish policy aims such as the Kyoto protocol, EU Renewable Energy Directive (2009/28/EC), UK Climate Change Act 2008, The Climate Change (Scotland) Act 2009; the Scottish Governments 2020 Routemap for Renewable Energy in Scotland and Scotland's Offshore Wind Route Map 2013.

3.3 Marine planning framework (policy, consenting and licensing)

3.3.1 Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009

The Marine (Scotland) Act 2010 created a new legislative and management framework for the marine environment within Scottish Territorial Waters (0 to 12 nm). This follows the UK Marine and Coastal Access Act 2009 under which Scottish Ministers have devolved authority for marine planning and conservation powers in the offshore region (12 to 200 nm).

Under these Acts the Scottish Government is required to prepare a National Marine Plan for Scottish Territorial Waters and the offshore zone. The National Marine Plan is being developed to clarify the overall objectives and policy framework for the management and sustainable development of Scotland's marine environment. The Draft National Marine Plan was published for consultation in July 2013. Consultation on the draft plan will continue until 13th November 2013.

The Scottish Government may also choose to prepare Regional Marine Plans. Boundaries for the Regional Marine Plans are in the process of being formulated. These are expected to be finalised in line with the publication of the National Marine Plan. Thereafter, the regional marine plan preparation process will be undertaken.

These Acts also required the Scottish Government to identify areas to be designated as Marine Protected Areas (MPAs) to afford protection to particular features of the natural and historic marine environment.

3.3.2 Marine policy statement - UK

The UK Marine Policy Statement (MPS) applies to all UK waters and has been adopted by the UK Government, the Scottish Government, the Welsh Assembly Government and the Northern Ireland Executive. The function of the MPS is to provide the framework for preparing Marine Plans and taking decisions affecting the marine environment. All national and regional marine plans must be in conformity with the MPS.

The objectives of the MPS are to: Promote sustainable economic development; enable the UK's move towards a low-carbon economy, in order to mitigate the causes of climate change and ocean acidification and adapt to their effects; ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets; and contribute to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues.

The MPS emphasises the importance of renewable energy and recognises the importance of considering marine renewable projects in marine planning, stating that "Contributing to securing the UK's energy objectives, while protecting the environment, will be a priority for marine planning".

3.3.3 Marine consents and licencing

Table 3-1 provides a list of the marine consent applications that the Hywind Scotland Pilot Project ES will support.

Table 3-1 Marine consent applications

Works	Consent	Description	Determining authority
Parts of the Project outside 12 nm (the WTG Units, moorings, inter array cables and part of the export cable outside 12 nm)	Marine Licence Under Section 6 of the Marine and Coastal Access Act 2009	Consent under a Marine Licence covers the deposit of any substance or object within the UK marine licensing areas (beyond 12 nm in Scotland) either on the sea or on or under the seabed. This covers the following areas of the Project: > WTG Unit anchors and moorings, inter-array cables and export cable.	Scottish Ministers (through Marine Scotland)
Parts of the Project within 12 nm below Mean High Water Springs (MHWS) (the export cable)	Marine Licence under Section 16 of the Marine (Scotland) Act 2010	Consent under a Marine Licence covers construction and deposit of structures below Mean High Water Springs (MHWS). This covers the following areas of the Project: > The deposit of objects under the seabed, e.g. cable to shore with open trench or directionally drilled cable landfalls / boreholes.	Scottish Ministers (through Marine Scotland)
The WTG Units, moorings, inter array cables and export cable	Energy Act 2004	Once the development is granted relevant Marine Licences the Department of Energy and Climate Change (DECC) will request production of a Decommissioning Programme (DP) which must be approved prior to the commencement of installation.	Department for Energy and Climate Change (DECC)
NOTE: Due to the size of the Project (less than 50 MW) and its location beyond 12 nm, consent is not required under Section 36 of the Electricity Act 1989. The determination period for a Marine Licence will be approximately 4 to 5 months rather than the 9 month period for a Section 36 application.			

3.4 Terrestrial planning framework (policy, consenting and licensing)

All onshore works above the MLWS including the infrastructure for the Project will be subject to the Town and Country Planning legislation, regulation, policy and guidance.

3.4.1 National policy

Relevant Scottish policies are set out in the following documents:

- The National Planning Framework (NPF);
- The consolidated Scottish Planning Policy (SPP);
- Planning Advice Notes and Designing Places; and
- Planning Circulars.

3.4.2 Regional policy

Strategic land use objectives and policy for North East Scotland and Aberdeenshire are set out in:

- North East Scotland together, Aberdeen and Aberdeenshire Structure Plan 2001 – 2016;
- Aberdeen City and Shire Structure Plan August 2009;
- Aberdeenshire Local Development Plan 2012; and
- Aberdeenshire Council Renewable Energy Strategy (2004).

Combined these document set the framework for land use development in North East Scotland and Aberdeenshire, including guidance for the development of renewable energy strategies and action plans.

3.4.3 Onshore consents and licencing

Table 3-2 provides a list of the onshore consent applications that will be supported by the ES for the Hywind Scotland Pilot Park Project.

Table 3-2 Onshore consent application

Works	Consent	Description	Determining authority
Onshore cable routing from MLWS and additional electrical infrastructure at the onshore switchgear yard	Planning permission under Section 28 of the Town and Country Planning (Scotland) Act 1997	Planning permission for the development of any area of land is required under Section 28. This covers the following areas of the Project: > The onshore cable routing and additional electrical infrastructure at the onshore switchgear yard.	Aberdeenshire Council

3.5 Environmental Impact Assessment legislation (marine and terrestrial)

Requirements for EIA are defined in the EIA Directive (85/337/EEC as amended by 97/11/EC) which has been transposed into Scottish law. The purpose of the EIA Directive is to ensure that the potential effects of a project on the environment are taken in consideration before development consent is granted. If a development is deemed to have potential to have a significant effect on the environment by virtue of its scale, size and location, then an EIA is required the results of which must be provided by the developer to the decision maker in the form of an ES. The competent authority cannot grant consent for an EIA development without taking into account an ES.

The Directive is legally transposed into Scottish law via statutory instruments known as Regulations. The following Regulations are applicable to the Project:

> Marine Works (Environmental Impact Assessment) Regulations (2007) as amended;

- These Regulations are relevant to those elements of the Project which require a marine license under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Action 2010, i.e. the WTG Units, moorings, inter array cables and export cable to shore;

> Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011

- The Regulations are relevant to the onshore elements of the Project which require planning permission under the Town and Country Planning (Scotland) Act 1997, i.e. the onshore cable and additional electrical infrastructure at the onshore switchgear yard (if required).

The Scottish Government's Draft Planning Circular: Planning Scotland's Seas - the relationship between the statutory land use planning system and marine planning and licencing (July 2013) confirms that a Section 36 Consent (under the Electricity Act 1989) is not required for the Hywind Scotland Pilot Park Project on the basis that the Project is located outwith territorial waters (12 nm) and is below the 50 MW capacity threshold for marine based generating stations in the offshore area (12 to 200 nm) (Scottish Government 2013).

The Scottish Government has also recently (August 2013) released a new Planning Advice Notice (PAN) for Environmental Impact Assessment in relation to the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. (PAN1/2013: EIA). Information presented in this advice note will be taken into account in the ES.

3.6 Nature conservation (including HRA and European Protected Species)

3.6.1 Habitats and Birds Directives

The European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) are transposed into Scottish Law in the terrestrial environment and out to 12 nm by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and into UK law for territorial waters beyond 12 nm by the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended). The Conservation of Habitats and Species Regulations 2010 do not apply to this Project on the basis that the Project does not require consent under Sections 36 of the Electricity Act 1989.

European sites protected under this legislation include Special Protected Areas (SPA), Special Area of Conservation (SAC) and RAMSAR sites where they overlap an SAC or SPA. The European Habitats Directive (92/43/EEC) aims to promote the maintenance of biodiversity by requiring EU Member States to maintain or restore representative natural habitats and wild species at a favourable conservation status, through the introduction of robust protection for those habitats and species of European importance.

As part of these protection measures, Member States are required to undertake assessments to determine whether a plan or project is likely to have an adverse effect on the integrity of a European site. This process of Appropriate Assessment is discussed in more detail in Section 21.

Member States are also required to enforce specific regulations which make it an offence to intentionally or recklessly capture, kill, injure, harass or disturb animals protected under the Habitats Directive (European Protected Species (EPS). EPS requirements are discussed further in the specific EIA topic sections where relevant.

3.7 Guidance and best practice

Current best practice guidelines for EIA methodologies and licencing for offshore renewables projects have been developed from UK Rounds 1, 2 and 3 offshore wind developments. Also of relevance to this Project is the Marine Scotland Licensing and Consents Manual 2012. Relevant guidance and best practice applying to specific EIA topics is identified in Sections 6 to 19.

4 STAKEHOLDER ENGAGEMENT

4.1 Approach to stakeholder engagement

Hywind Scotland will be among the first floating offshore wind farms in the world and attention from a wide audience is expected. This makes it essential to communicate effectively with statutory bodies, stakeholders and members of the general public to disseminate information on the proposed Project including its benefits and potential impacts. SWL is committed to the highest environmental standards and best practice throughout the entire Project lifecycle and will, with necessary adaptions specific to Scottish regulations, administrative set-up and culture, base the stakeholder engagement for the Hywind Scotland Pilot Park Project on experiences gained from similar SWL Projects including Sheringham Shoal and Dudgeon offshore wind Projects off the coast of Norfolk, England and other international projects.

This section describes how external communication and consultation will be managed and co-ordinated as part of the EIA and NRA processes.

The main aim for the stakeholder management process is to build constructive relationships with pertinent stakeholders and members of the public to ensure that as many organisations as possible are made aware of the Project and have an opportunity to provide feedback and relevant data/information. The purpose of communication and consultation with external organisations is to ensure appropriate and timely engagement is made with the relevant groups, organisations and individuals in order that the necessary processes (e.g. licensing/consenting) are undertaken to a satisfactory outcome; but also to help identify any potential conflicts and opportunities and establish the preferred options that present the lowest risk and most benefit for all concerned.

4.2 Stakeholder engagement strategy

To ensure effective stakeholder engagement, SWL, together with Xodus, has prepared a 'Stakeholder Management Plan' and 'Stakeholder Database'. Both are live documents and will be updated during the Project to incorporate any changes in conditions, strategy, stakeholder roles or interactions.

For successful stakeholder engagement it is essential that:

- The groups and individuals interested in or affected by the Project are identified;
- Information issued is accurate, understandable, issued at the appropriate time and does not overwhelm recipients;
- Dialogue is held between those affected by the decisions and those responsible for making the decisions;
- The information provided by the public and consultees are incorporated within the final decision making process and final decision; and
- Feedback is provided to all consultees including the public explaining the actions taken and how the final decision has been influenced by the process.

Using experience from previous similar projects and incorporating the requirements of legislation (e.g. Public Participation Directive), an overview of the Hywind Scotland Pilot Park Project stakeholder engagement strategy is presented in Figure 4-1.

Figure 4-1 Overview of stakeholder engagement strategy

1. Identification of interested groups/stakeholders

a. Identify stakeholders;
b. Develop and maintain stakeholder database to record contact details and provide a record of communication e.g. meeting minutes, and any actions arising.

2. Seek input and comment

a. Provide initial communication on the Project through letter for distribution to all stakeholders, to provide information about SWL, Hywind and the Hywind Scotland Pilot Park Project and to invite stakeholders to provide early feedback on the Project;
b. Meet with statutory consultees and other selected consultees to meetings/workshops to discuss the Project scope and survey / study methodologies;
c. Produce EIA Scoping Report for distribution to consultees;
d. Provide consultees with a copy of Scoping Report and feedback mechanism; and
e. Hold public consultation event following issue of the Scoping Opinion, to ensure that the wider community is aware of the Project and have an opportunity to contribute.

3. Ongoing dialogue

a. Ongoing meetings throughout EIA with relevant organisations/individuals on key issues; and
b. Communicate key messages from the Project through a range of tools including public events, press releases, printed material (e.g. newsletters, fact sheets, display boards), the general SWL/Hywind website, and attendance at relevant conferences and events.

4. Provide feedback

a. Meetings and/or presentations before submission of ES to feedback on consultation and EIA process; and
b. Develop a final consultation report detailing consultations undertaken and key outcomes.

5. Statutory consultation

a. Statutory public consultation period of 28 days; and
b. Work through issues raised during public consultation with regulators and their advisors.

6. Commitments and on-going consultation

a. Develop and maintain commitments register (throughout Project) and include commitments made in ES and consent conditions.
b. Incorporate recommendations from the ES and consent conditions within an Environmental Management Plan (EMP) to ensure carried through to implementation;
c. Ongoing consultation post ES approval as required.

4.3 Pre-scoping consultation

In advance of preparation of this Scoping Report, SWL and its appointed consultants Xodus (EIA) and Anatec (NRA) have met with a number of individuals and organisations. The majority of these meetings were set up following distribution of a Project briefing letter which outlined the proposed Project and provided opportunity for early feedback.

Appendix B details all the stakeholders that have been identified for the Project and who was sent the Project briefing letter and the status of the consultation with each stakeholder prior to the issue of this Scoping Report.

The following organisations have met with SWL and Xodus (and / or Anatec), and where appropriate results of discussions have been taken into consideration during scoping:

- Aberdeenshire Council;
- Buchan Inshore Fishermen's Association (BIFA);
- Joint Nature Conservation Committee (JNCC);
- Ministry for Energy, Enterprise and Tourism and the Energy Division;
- Maritime and Coastguard Agency (MCA);
- Marine Scotland;
- Northern Lighthouse Board (NLB);
- National Oceanographic Centre (NOC);
- Peterhead Port Authority;
- Royal Yachting Association (RYA);
- Scottish Fishermen's Federation (SFF);
- Scottish Natural Heritage (SNH);
- The Crown Estate (TCE); and
- Whale and Dolphin Conservation Society.

4.4 Stakeholder identification

It is essential that stakeholders are defined at an early stage of the EIA process in order to facilitate communication and consultation in a way that meets the needs of the development, and the stakeholders. There are two groups of stakeholders which have been identified:

- Regulator Group – includes regulatory organisations and their advisors (statutory and non-statutory) who have a legal remit or responsibility in the issuing of consents, licenses, leases and approvals for the Project; and
- Stakeholder Group – includes organisations that have an interest in the Project due to the nature and remit of their objectives and/or activities, and/or geographical location.

4.4.1 Regulator Group

The Regulator Group consists of the regulating authority Marine Scotland and Aberdeenshire Council, their statutory advisors and selected non-statutory consultees including the following:

- Marine Scotland – Licensing Operations Team (MS-LOT);
- Scottish Environment Protection Agency (SEPA);
- Scottish Natural Heritage (SNH);
- Northern Lighthouse Board (NLB);
- Maritime and Coastguard Agency (MCA);
- Marine Scotland Science (MS-Science);
- Marine Scotland Compliance (MS-Compliance);
- Ministry of Defence (MOD);
- Department of Energy and Climate change (DECC);
- Aberdeenshire Council Planning Department; and
- The Crown Estate (TCE).

Towards this group, SWL adopts a strategy of open and frequent discussion and the transfer and sharing of information. The Project will continue to meet with Marine Scotland and Aberdeenshire Council on a regular basis providing there is suitable progress in the Project worthy of discussion. Where specific issues need to be addressed with the Regulator Group, these meetings will be organised as required. Where several issues may be addressed in one meeting this will be the preference over a number of smaller meetings. SWL appreciates the time pressures on organisations and will work to ensure an efficient and acceptable approach to on-going engagement.

4.4.2 Stakeholder Group

The Stakeholder Group includes organisations with an interest in the Project but who are not identified within the Regulator Group. The main objective of engaging the Stakeholder Group, aside from meeting the requirements under the EIA Directive and EIA Regulations regarding consultation, is to ensure that as many organisations as possible are made aware of the Project and have an opportunity to provide feedback and relevant data/information. Stakeholder engagement aims to address any concerns and to maximise any potential opportunities that arise throughout the EIA and NRA processes.

Members of the Stakeholder Group would include:

- Non-Statutory Consultees (as identified through consultation with the regulators);
- Organisations that have an interest in the Project due to the nature and remit of their group objectives and/or activities and also their location; and
- Local organisations, groups and businesses in the vicinity of the Project.

Different members of the Stakeholder Group will be engaged as specific technical issues dictate.

4.5 Public consultation

The purpose of public consultation is to ensure that the wider community is aware of the proposals and are confident that the Project has followed the correct procedures (e.g. EIA, NRA) and have an opportunity to contribute. Public consultation will be undertaken at key stages within the EIA and NRA processes and meet the requirements of the legislation. A public consultation event is planned for Q1 2014, which is likely to be in the form of public notices and information sessions. Further events and consultation will be considered as the Project progresses, during which it may be appropriate to consider alternative means of broader public consultation including press releases, printed material (e.g. newsletters, fact sheets, display boards) and through the SWL/Hywind website.

4.6 Consultation beyond application submission

Consultation will continue beyond the submission of the ES. Assuming successful award of Project consent, licence condition implementation, including the development of appropriate environmental monitoring protocols, will generally require continuing engagement and consultation with the regulators and their statutory consultees. In addition, SWL will continue its communications with the local community and wider public to keep them informed of the Project process and key milestones.

5 APPROACH TO SCOPING AND EIA

5.1 Introduction

EIA is an assessment of the potential impacts of a project on the environment. The EIA process identifies the areas of a Project where significant environmental impacts may occur and outlines mitigation measures or management techniques aimed at reducing or offsetting these effects. This EIA Scoping Report has been prepared in accordance with the Marine Works (Environmental Impact Assessment) Regulations 2007. Requirements of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 have also been taken into account for the onshore components of the Project for which a voluntary ES will be submitted.

In addition to the EIA, the Marine Licence application for the Project will also be supported by a:

> Navigational Risk Assessment (NRA) – see Section 14 and Appendix C; and

> Habitat Regulations Appraisal (HRA) – see Section 21.

Both of these assessments will form an integral part of the overall EIA process.

5.2 EIA Process

EIA is the process of systematically identification of the potential impacts that the Hywind Scotland Pilot Park Project could have on the environment. The process involves developing a detailed understanding of the both the Project e.g. proposed installation, operation and decommissioning activities, and the environment within which the Project will be located. The potential impacts of the Project are then evaluated to determine how the Project would affect the environment and the significance of those effects.

Where potential impacts are likely to be significant, specific measures will need to be taken either directly or through the design, construction, operation and decommissioning of the Project to reduce or remove such effects (mitigation measures). The EIA process also requires the identification of measures to monitor the predicted impacts of the Project long term.

The overall EIA process is delivered through number of clearly defined stages, namely screening, scoping, the environmental assessment, planning and monitoring. These are illustrated in Figure 5-1.

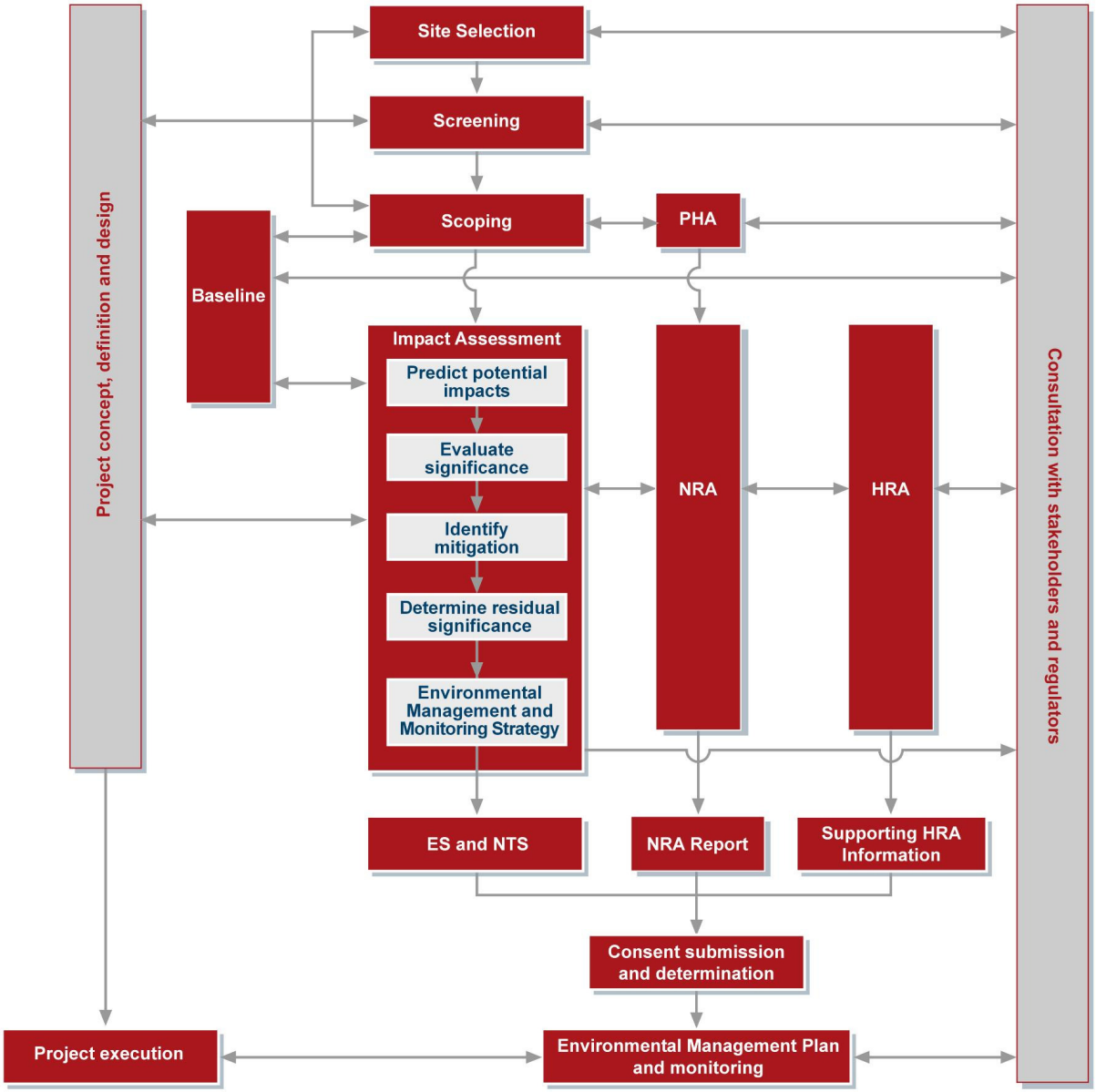
5.2.1 Screening

Screening is the process for determining whether or not a Project requires an EIA in accordance with relevant EIA Regulations. Developers can request for the regulator (in this case Marine Scotland for the offshore components of the Project and Aberdeenshire Council for the onshore components of the Project) to provide a screening opinion as to whether or not an EIA is required. Screening responses for the Hywind Scotland Pilot Park Project were issued on 14th August 2013 (Marine Scotland) and 19th July 2013 (Aberdeenshire Council).

5.2.2 Scoping (this document)

The main purpose of scoping is to define the scope of the EIA (and in this case also the NRA and HRA) in terms of: describing the Project that will be assessed; the characteristics of the environment in which the Project will be located; identifying the potential impacts that the Project may have on the environment (including cumulative and in-combination effects); and identifying approaches/methods for assessing those impacts.

Figure 5-1 The EIA Process



5.2.3 EIA and preparation of the Environmental Statement

The EIA will commence following receipt of the Scoping Opinion and will be carried out in line with the information included in the Scoping Report and advice provided in the Scoping Opinion. The main focus of the EIA is to assess the potentially significant impacts of the Project on the environment. This requires the provision of a detailed project description and description of the baseline environment, information on the importance and sensitivity of certain receptors, an assessment of the magnitude and significance of potential impacts (including cumulative and in-combination effects) and the identification of measures to avoid, reduce or remedy any potential significant effects. The EIA process also requires the identification of proposals for monitoring and environmental management (Environmental Management Plan).

EIAs are required to consider potential impacts relating to all stages of a Project including installation, operation and maintenance and decommissioning. The assessment is also required to consider all geographical areas associated with the Project, in this case, the proposed AfL Area (Pilot Park), the export cable route, the landfall, the onshore cable and the onshore switchgear yard.

Where appropriate e.g. as part of the NRA, possible impacts occurring at the inshore deep water WTG Unit assembly site and along the tow route will also be taken into consideration in the EIA, subject to available information on the location of the facility / confirmation of the tow route. However, as advised by Marine Scotland during the pre-scoping meeting on 14th June 2013 operations at the WTG Unit assembly facility and towing activities are likely to be subject to a separate Marine Licence for which SWL will apply once the location of the assembly facility and information on the preferred tow route is known. As part of this separate Marine Licence consideration will need to be given to the potential effects of activities at the assembly site and along the tow route on the environment in particular, navigation, commercial fisheries and protected habitats and species.

5.2.4 Development of the design envelope

Throughout the EIA process the approach will be to assess the maximum potential impacts (also sometimes referred to as a 'worst case'). This approach, which used to be referred to as the 'Rochdale Envelope' has been established through relevant case law. These case precedents have established a custom and practise that has evolved in relation to projects where the final design is not available at the consent application stage. This approach has been confirmed by the courts and endorsed by the Scottish Government as enabling the legal requirements of the relevant EIA Regulations to be complied with, as long as appropriate conditions are placed in the resulting consents to ensure that the maximum potential likely impacts will not be exceeded by the final built development, and will not give rise to a likely significant effect on the environment that has not been assessed.

The design envelope provides essential flexibility to enable projects to take full advantage of on-going improvements in technology, infrastructure and installation technique's, and for this Project will allow SWL to move towards their goal of future development of future larger scale commercial floating offshore wind farms. To commit to a detailed development design at consent application stage would also prevent the Project benefiting from the lessons learned from other work being done in the offshore wind industry, including the continued testing of the Hywind Demo.

5.2.5 Cumulative and in-combination effects

Further information on the approach to the assessment of cumulative and in-combination impacts and projects that will be included in the cumulative and in-combination impact assessment is included in Section 20.

5.3 Approach to preparation of this Scoping Report

The following Sections (6 to 19) follow a consistent structure which aims to:

- Describe the baseline environment based on readily available sources or work already conducted and early feedback from consultation;
- Identify data gaps and how further data will be collected;
- Identify any surveys or studies that may be required, or are already underway as part of the baseline environment characterisation strategy; and
- Identify potentially significant impacts and strategies for the assessment these as part of the EIA.

It is worth noting that due to the stage of the submission of this Scoping Report there are some topics that have had extensive desk based reviews conducted to inform survey requirements and design e.g. ornithology. Consequently some baselines are described in more detail than others.

5.3.1 Impact identification

The impacts identified in each of the sections are based on information obtained during an Environmental Issues Identification (ENVID) workshop which was held on 22nd June 2011 with the Hywind Scotland Pilot Park Project Team (Xodus, 2011) and feedback from regulators, their advisors and other stakeholders obtained during meetings or from written responses.

For each potential impact that has been identified a potential significance has been assigned in order to help inform what further work is required during the EIA. Table 5-1 shows the impact significance key that has been adopted to categorise each potential impact.

Table 5-1 Impact significance key

Colour / ranking	Description of potential impact significance
No impact	No effect, and therefore scoped out of EIA
Low	Low/negligible effect, unlikely to be significant, and therefore scoped out of EIA
Medium	Potential medium effect requiring further data and/or assessment as part of the EIA to determine significance
High	Potentially significant effect requiring detailed investigation in the EIA
Unknown	Unknown effect requiring further data and/or assessment as part of the EIA
Positive	Beneficial effects of the Project to be included in the EIA as requested by Marine Scotland

6 ORNITHOLOGY

6.1 Assessment strategy

6.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on birds will be based on the following:

Table 6-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 6.2
	Seabird surveys – 12 months of seabird surveys	Section 6.3
	Statistical analysis of survey data	Section 6.3
Impact assessment	Assessment of impacts based on statistical analysis of data from seabird surveys.	Section 6.5

6.1.2 Justification for proposed assessment strategy

In June 2013, the Seabird Discussion Document (Document Ref: A100142-S00-TECH-002) was submitted to Marine Scotland. This document supersedes an earlier version of the Seabird Discussion Document which was submitted to, and approved by, Marine Scotland in 2011. The document includes a review of existing data and information on the distribution and abundance of seabirds (and migratory wildfowl) in relation to the Hywind Scotland Pilot Park Project proposed AfL Area and sets out the proposed method for the commissioned seabird surveys which are being carried out to inform the assessment of potential effects of the Project on ornithology. Feedback on the updated Seabird Discussion Document was provided by Marine Scotland on 2nd September 2013. Where appropriate information included in Marine Scotland's response has been included in this Scoping Report.

In developing the seabird survey methodology it was agreed that provisions would be made to collect up to two years' worth of data, with one year pre-consent application and an additional year pre-installation if required. The requirement to survey for a second year will be determined through discussion with Marine Scotland, JNCC and SNH based on results from year one. It was also agreed as part of the survey methodology that due to the relative small size of the proposed AfL Area the most suitable survey technique would be to carry out boat-based surveys.

It is not intended to reproduce the information from the Seabird Discussion Document in this Scoping Report. This section therefore provides a high level overview of the relevant information that was presented in the Seabird Discussion Document with particular focus on:

- Distribution, density and abundance of seabird species in relation to the proposed AfL Area based on data from the ESAS database;
- Overview of Special Protection Areas (SPAs) that could potentially be affected by the Project on the basis of qualifying interests of those site; and
- Overview of the seabird survey scope and method (ESAS survey) which is described in detail in the Seabird Discussion Document.

Where updates are required as part of the EIA process based on comments received on the Seabird Discussion Document these have also been identified. Further information on the proposed approach to the HRA including identification of the information required to assess potential effects on SPA sites is included in Section 21.

6.2 Baseline environment – desk based study

6.2.1 Sources of baseline data

The following sources of baseline data and information will be used to inform the desk study for the ornithological assessment.

Table 6-2 Baseline data sources (excluding surveys)

Type / description of data	Source	Status
European Seabirds at Sea (ESAS) Database	JNCC website http://jncc.defra.gov.uk/page-4469	Collected – see high level baseline description below.
National Seabird Census (Seabird 2000)	JNCC website http://jncc.defra.gov.uk/page-1548	Collected – see high level baseline description below.
Seabird Monitoring Programme	JNCC website http://jncc.defra.gov.uk/page-1550	Included in Seabird Discussion Document.
Future of the Atlantic Marine Environment (FAME) database	RSPB http://www.rspb.org.uk/ourwork/projects/details/255106-future-of-the-atlantic-marine-environment-fame-#downloads	To be reviewed as part of the EIA.
Species factsheets (foraging ecology and global distributions etc.)	Bird Life International	To be reviewed as part of the EIA.
Bass Rock Gannets – satellite telemetry studies	Hamer *et al* (2000, 2001)	Included in Seabird Discussion Document (Xodus, 2013a).
Migration routes for migratory wildfowl	Wildfowl and Wetlands Trust (WWT)	Included in Seabird Discussion Document (Xodus, 2013a).
The Strategic Ornithology Support Services (SOSS) Migrant Assessment Tool	BTO website: (http://www.bto.org/science/wetland-and-marine/soss/projects)	Data / information to be reviewed as part of environmental assessment.
SPA Citations	SNH website http://gateway.snh.gov.uk/sitelink/index.jsp	Included in Seabird Discussion Document (Xodus, 2013a).
UK SPA Review - site accounts	JNCC website http://jncc.defra.gov.uk/page-162	Collected – see high level baseline description below.

6.2.2 Desk-based review of existing information

Seabirds

A high level review of historical data on bird distribution in the proposed AfL Area, including ESAS data, indicates that a number of nationally and internationally important seabird species have been previously recorded as occurring within the proposed AfL Area. These include: common guillemot *Uria aalge*, northern fulmar *Fulmarus glacialis*, razorbill *Alca torda*, Atlantic puffin *Fratercula arctica*, northern gannet *Morus bassanus,* and a number of gull species including herring gull *Larus argentatus,* black-legged kittiwake *Rissa tridactyla* and great black backed gull *Larus marinus.*

Other species reported in the proposed AfL Area include little auk *Alle alle*, Arctic skua *Stercorarius parasiticus*, great skua *Stercorarius skua,* other tern species and occasionally sightings sooty shearwater *Puffinus griseus* (Stone *et al*., 1995). Low densities of common tern *Sterna hirundo*, Sandwich tern *Sterna sanvicensis*, lesser black-back gull *Larus fuscus* and great skua *Stercorarius skua* were also recorded.

During the breeding season, records indicate that the most abundant species was common guillemot, with black-legged kittiwake, northern fulmar, herring gull, razorbill, Atlantic puffin and northern gannet also commonly present. Northern fulmar was recorded as being the most abundant species during the non-breeding season. Atlantic puffin, common guillemot, black-legged kittiwake, great black backed gull, herring gull and Northern gannet were also recorded as being commonly present during winter.

Migratory birds

Migrant birds from breeding or staging areas in Scandinavia, arctic Europe, Siberia and Svalbard may potentially pass through the proposed AfL Area. Although information on precise migration routes is limited, for many bird species there is a large amount of information on the origins and destinations of migrants from ringing studies (Langston, 2010; Wernham *et al*., 2002, BTO Migration Mapping Tool). The Wildfowl and Wetlands Trust (WWT) are undertaking COWRIE commissioned research on migration routes of several geese and swan species in relation to UK wind farm sites. Geese and swans were the focus for this research as they tend to fly at less than 100 m above sea level and could therefore be at risk of collision with wind turbines. The WWT research shows that migrating Svalbard barnacle geese, which are qualifying features of the Loch of Strathbeg SPA and Solway Firth SPA are likely to fly through the proposed AfL Area (Scottish Government 2011, WWT 2013).

Conservation

European rare or vulnerable species of bird listed in Annex I (Article 4.1) and regularly occurring migratory species (Article 4.2) of the Birds Directive (European Directive 2009/147/EC on the conservation of wild birds) are afforded protection through the designation of SPAs. SPAs, together with SACs form a network of sites (Natura sites) designated under the European Habitats Directive (EC Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna).

In Scotland, the provisions of the Birds Directive are implemented through the Wildlife and Countryside Act 1981, whereas provisions of the Habitats Directive are implemented through the Conservation (Natural Habitats &C) Regulations 1994 (as amended). Various species of waterfowl are also protected through the designation of Ramsar sites which are designated to protect wetlands of international importance designated under the Ramsar Convention 1971.

There are a number of SPAs along the east coast of Scotland where seabirds and migratory waterfowl are a qualifying interest and therefore could be connected to the proposed AfL Area. These sites are illustrated in Figure 6.1. The SPAs where seabirds are a qualifying interest located closest to the site include Fowlsheugh SPA, Buchan Ness to Collieston Coast SPA and Troup, Pennan and Lions Head SPA. However, there are a number of other seabird SPAs located further afield e.g. along the Caithness and Orkney coasts and islands and within the Firth of Forth. There are two SPAs designated for migratory and overwintering waterfowl located within 50 km of the proposed AfL Area , the Loch Skene SPA and Loch of Strathbeg SPA.

The ornithology desk study for the ES and the HRA (see Section 21) will examine in detail the anticipated strength of connectivity between designated ornithological sites (SPAs) and the Pilot Park. For breeding seabirds, this will included an analysis of metadata on foraging ranges (e.g. Thaxter *et al* 2012).

The desk study will also summarise information on designated sites that could potentially be affected by the Project with reference to:

- Citations and latest reference populations for specific sites and species;
- Qualify and ‘assemblage qualifier’ species;
- Conservation objectives for the site and qualifier status; and
- Information on seasonal trends e.g. abundances and distributions.

6.3 Baseline environment – commissioned surveys and data analysis

Boat-based seabird surveys (ESAS surveys as described by Camphuysen *et al*., 2004) commenced in June 2013 and have been successfully completed for June, July, August and September 2013. These surveys are being carried out by NRP from the vessel MV Eilean May in accordance with the survey design and method described in the Seabird Discussion Document (Xodus, 2013a).

The aim of the ESAS surveys is to establish the distribution, abundance and behaviour of seabirds in the proposed AfL Area and surrounding waters and how these vary seasonally. The survey has been designed in line with current published guidance including COWRIE guidelines; Camphuysen *et al*., 2004; Webb & Durinck, 1992; Thomas *et al*., 2010; Maclean *et al*., 2009; and Jackson and Whitfield, 2011, to ensure the accurate characterisation of seabirds within the proposed AfL Area and surrounding buffer zone. Each survey encompasses a single survey area of 45.3 km^2 comprising the proposed AfL Area and a surrounding 3 km buffer. The pre-consent application surveys are being carried out at approximately monthly intervals (subject to practical weather and HSE constraints) for a period of 12 months.

Each survey involves collecting data on the number of birds on the sea surface and in flight. Records of birds on the sea are assigned to one of five distance bands from the transect line (Camphuysen *et al*., 2004). Records of flying birds are assigned to one of seven height bands[5] and the travel direction octant (Camphuysen *et al*., 2004).

Data collected from the surveys will be processed and subject to Distance Sampling Analysis (Buckland *et al*., 2004, Thomas *et al*., 2010). This will involve:

- Provision of **design-based density and abundance estimates** for all bird species including birds on the water, birds in flight and both combined. Estimates will include individual (monthly) surveys and, where appropriate for species specific seasons (e.g. pre-breeding season, breeding season, post-breeding season, winter);
- **Density surface modelling** for selected key species, where sample sizes allow where these models potentially allow more accurate abundance and density estimates to be derived for small subareas than is possible using design based estimates;
- Production of **distribution maps** for all species. Spot maps will be provided for all species (size of spot indicating estimated numbers of birds present in a transect segment, corrected for detectability). For selected key species, where sample sizes allow, these maps will be underlain by maps based on density surface models. These models potentially allow more accurate abundance and density estimates to be derived for small sub areas than is possible using design based estimates. The models would also provide the basis for any subsequent impact modelling;
- **Statistics on flying birds** summarising flight height frequency distribution and collision risk modelling for selected species; and
- For selected species, for birds in flight, **statistics and maps summarising flight direction**, where these might be useful in identifying connectivity between breeding sites (in particular SPAs) and the proposed AfL Area

An Interim Report will be produced and submitted to Marine Scotland that will summarise the results from the first five months of ESAS survey work (June to October 2013). This report will give further consideration as to what analyses will be of greatest value to the EIA and HRA.

6.4 Data and information gaps

The boat-based survey discussed in Section 6.3 has been designed to ensure that there are no major data gaps with respect to seabirds. Due to the relative small scale of the Project (up to 30 MW based on up to five WTG Units) it is assumed that radar studies for migratory wildfowl are not required and that any impacts on wintering wildfowl migrating through the area will be assessed on the basis of information from desk studies only. Further justification for this approach is provided in the Seabird Discussion Document (Xodus, 2013a).

[5] 0 - 2m, 2 - 10m, 10 - 25m, 25 - 50m, 50 - 100m 100 - 200m and >200m

6.5 Identification of potential impacts

Potential impacts, and potential significance of the impacts on seabirds and migratory wildfowl, are considered in Table 6-3 below.

Table 6-3 Potential significance of potential impacts on seabirds and migratory wildfowl

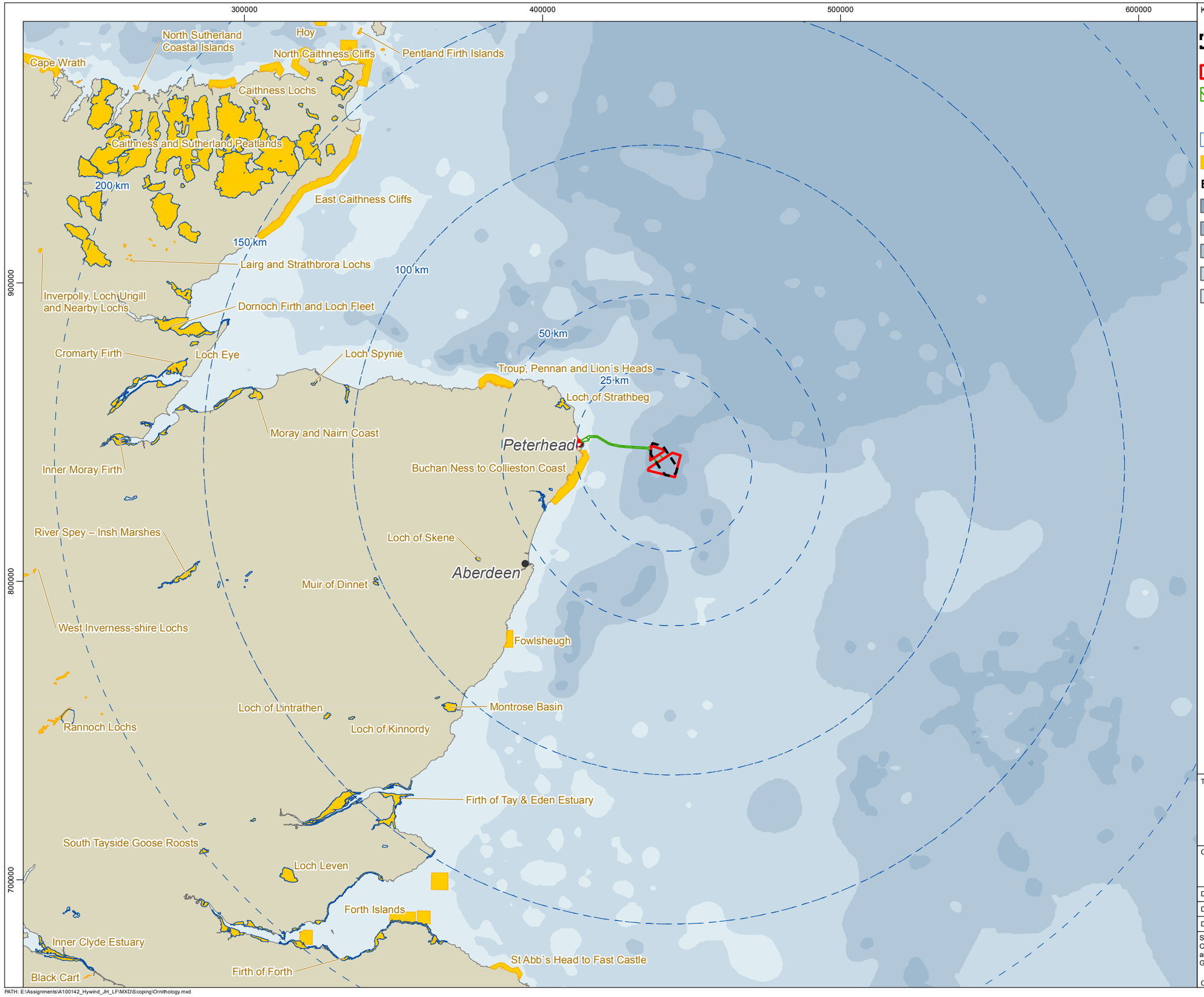
Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Vessel disturbance	Med	Low	Low	Any impacts on seabird populations are unlikely to be significant due to low number of vessels that will be involved in construction / installation of the WTG Units or O&M activities and relative low sensitivity of the species present. However, further assessment will be required once the ESAS surveys are complete to confirm that significant impacts are unlikely.	Yes
Collision risk – mortality due to collision with rotor blades	No impact	Med (for some species only)	No impact	Gannet and gull species anticipated to be exposed to a moderate collision risk on the basis of their expected flying height and density. The small scale of the Project (up to 5 turbines) means that the collision risk is to populations of these species is expected to be at most of medium significance. Collision risk to all other seabird species is expected to be very low.	Yes
Displacement (avoidance) due to presence WTG Units	No impact	Med	No impact	Impacts on seabird populations likely to be of low significance for all species due to the small scale of the Projects anticipated impact footprint (area affected by the Project) and the expected seabird densities based on existing information. However, further assessment will be required once the ESAS surveys are complete to confirm that significant impacts are unlikely.	Yes
Indirect effects from changes in habitat and distribution / abundance of prey species	No impact	Med	No impact		Yes
Pollution due to leaks and spills from vessels and WTG Units	Low	Low	Low	Due to the small scale of the Project, limited number of vessels involved during construction and O&M and fact that the WTG Units will be installed pre-assembled, potential sources of pollution are limited and significant impacts on seabirds are unlikely. Construction industry good practices and procedures will be followed and appropriate emergency procedures will be put in place.	No
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

6.6 Approach to assessment of potential impacts

The following impact assessment strategy will be applied to address the potentially significant impacts or unknown impacts discussed in Table 6-4.

Table 6-4 Impact assessment strategy for seabirds and migratory wildfowl

Potential impact	Assessment method	Relevant guidance
Vessel disturbance	Assessment of impacts based on predicted levels of disturbance e.g. number of vessels in area etc., importance of area for each seabird receptor population and sensitivity of different species to disturbance.	A Review of Assessment Methodologies for Offshore Windfarms (Maclean *et al*., 2009). Potential use of population viability analysis to assess the impact of offshore windfarms on bird populations (Maclean *et al*., 2007). Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers (King *et al*., 2009). Survey methods for use in assessing the impacts of onshore windfarms on bird communities (SNH, 2005a). Assessing the significance of impacts from onshore windfarms on birds outside designated areas (SNH, 2006). Use of avoidance rates in the SNH windfarm Collision Risk Model (SNH, 2010). Guidelines for ecological impact assessment in Britain and Ireland: Marine and Coastal (IEEM, 2010). Assessing the cumulative impact of onshore wind energy developments (SNH, 2012) (See Section 20).
Collision risk – mortality due to collision with rotor blades	Collision Rate Modelling (CRM) to predict the effect on annual mortality rate of each seabird receptor population. Only required for species that regularly fly at rotor height, e.g. gannet and gull species.	
Displacement (avoidance) due to presence of WTG Units	Assessment of impacts based on importance of area for each seabird receptor population, and sensitivity of different species to displacement by WTG Units.	
Indirect effects from changes in habitat and prey availability	Assessment of impacts based on importance of area for each seabird receptor population, and sensitivity of different species to availability of local habitats and prey.	



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation
- Ramsar
- Special Protection Area

Bathymetry (m)

- 200 - 500
- 100 - 200
- 75 - 100
- 50 - 75
- 0 - 50

0 5 10 15 20 nm

0 10 20 30 40 km

N

TITLE:

Figure 6.1
Special Protection Areas (SPA) designated for seabirds and migratory waterfowl and Ramsar sites in eastern Scotland

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:1,250,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: Ornithology.mxd			A01

SOURCE: Copyright Scottish Natural Heritage
Contains Ordnance Survey data © Crown copyright and database right 2013
GEBCO

COORDINATE SYSTEM: British National Grid

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\Ornithology.mxd

7 BENTHIC AND INTERTIDAL ECOLOGY

7.1 Assessment strategy

7.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on benthic and intertidal ecology will be based on the following:

Table 7-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 7.2
	Offshore benthic survey (carried out as part of geophysical surveys)	Section 7.3
	Intertidal phase 1 biotope survey	Section 7.3
	Data analysis and survey reports	Section 7.3
Impact assessment	Assessment of impacts based on offshore benthic and intertidal surveys and data obtained from desk based study	Section 7.6

7.2 Baseline environment – desk based study

7.2.1 Sources of baseline data

As part of the desk based study for the benthic and intertidal ecology assessment, baseline data and information will be collected from the following sources:

Table 7-2 Baseline data sources (excluding surveys)

Type / description of data	Source	Status
Literature and videos collected in the wider marine area of the benthic and intertidal environment	Published literature Strategic Environmental Assessments JNCC UKSeaMap Marine Scotland video surveys	Collected – see high level baseline description below.

7.2.2 Desk-based review of existing information

In July 2013 a benthic survey scope document (Document Ref: A-100142-S00-TECH-001) was submitted to approved by Marine Scotland prior to the mobilisation of the offshore benthic survey (Xodus, 2013b). This document contained information on the following:

> High level review of existing information on the benthic environment in the wider Exclusivity Area and along the export cable route corridor, including the analysis of videos taken by Marine Scotland within the Buchan Deep; and

> Benthic environment survey scope. A detailed description of the proposed survey scope and method for the Hywind Scotland Pilot Park Project. Results from this survey will be presented in a Technical Environmental Report which will be used to inform the assessment of impacts of the offshore components of the Project on benthic communities.

The survey method was approved by Marine Scotland on 25th July 2013. It is not intended to reproduce the information from Benthic Survey Scope document in this Scoping Report. However, the information will be used to inform the assessment of potential impacts on benthic communities in the proposed AfL Area and along the export cable route that will be carried out as part of the EIA.

Benthic and intertidal communities

Infaunal community distribution in the wider North Sea is relatively well described over broad scales due to historical surveys (e.g. Basford *et al.* 1989; 1990; Künitzer *et al.*, 1992; Eleftheriou & Basford 1989). Künitzer *et al.* (1992) assign the seabed around the Exclusivity Area and proposed AfL Area to group IVa which is typified by the species *Ophelia borealis*, *Exogone hebes*, *Spiophanes bombyx* and *Polycirrus* sp.

Similarly benthic epifaunal communities in the North Sea are relatively well described over broad scales due to information recovered fishing trawls and recent photographic surveys (DECC, 2009). Shallower waters off the Buchan Coast have been described as being typified by the presence of sponges; and a deeper (<100 m), finer sediments contain tunicates and the shrimp *Spirontocaris lilljeborgi* (DECC, 2009).

The wide scale sediment and habitat mapping programme JNCC UKSeaMap provides an overview of the sediments and habitats likely to be present in areas of the North Sea (JNCC, 2010a). The UKSeaMap programme builds upon previous datasets on sediment and habitats distribution from MESH (Mapping European Seabed Habitats) in 2008 and British Geological Survey sediment data. This programme has predicted seabed habitats of deep circalittoral sand with the high class biotope of circalittoral sandy mud (SS.SMU.CSaMu) within the Exclusivity Area and proposed AfL Area, progressing westwards to deep circalittoral and circaittoral coarse along the export cable corridor (JNCC, 2010a). The biotope of circalittoral sandy mud (SS.SMU.CSaMu) is described as a cohesive sandy mud off wave exposed coasts with weak tidal streams, which can be characterised by super-abundant *Amphiura filiformis* with *Mysella bidentata* and *Abra nitida*. This community occurs in muddy sands in moderately deep water. This community is also characterised by the sipunculid *Thysanocardia procera* and the polychaetes *Nephtys incisa*, *Phoronis* sp. and *Pholoe* sp., with cirratulids also common in some areas. Other taxa such as *Nephtys hombergii*, *Echinocardium cordatum*, *Nucula nitidosa*, *Callianassa subterranea* and *Eudorella truncatula* may also occur in offshore examples of this biotope (JNCC, 2013).

During consultation with Marine Scotland in 2011 SWL was made aware of and subsequently sent, a number of seabed videos and still images taken by Marine Scotland during a 2010 cruise in the Buchan Deep. This video footage shows a seabed substratum composed of fine rippled sand with occasional shell fragments. No epifauna or evidence of burrowing fauna was observed in any of the images or footage. On the basis of these observations the high level biotope classification SS.SMU.CSaMu (circalittoral sandy mud) was assigned to the habitats observed. However, only a very small area of the Exclusivity Area was sampled, and therefore other species and habitats could be present in the Exclusivity Area and proposed AfL Area.

The intertidal area within the landfall area of search is largely comprised of rock with occasional rockpools and large boulders. There are occasional patches of barren cobbles and boulders at the high shore. To the north on approach to the mouth of the River Ugie, smaller boulders and eventually sand begins to dominate the littoral habitat, with outcrops of rock. Very little information or data has been published on the intertidal area.

Habitat protection

There are currently no designated or identified coastal or offshore SACs for the presence of benthic habitats or species within 150 km of the proposed AfL Area or the export cable corridor. There is a SAC located to the south of the Peterhead (the Buchan Ness to Collieston SAC) which is designated for its vegetated seal cliffs of Atlantic and Baltic coasts.

The Marine (Scotland) Act 2010 has established new powers to designate MPAs in Scottish territorial waters, including those for nature conservation. In addition, the Marine and Coastal Access Act (2010) sets out new

powers for the UK Government to designated MPAs in UK offshore waters, including Scotland. Consequently in December 2012 SNH and JNCC submitted formal advice to Scottish Government on the selection of Nature Conservation MPAs in Scotland's offshore and territorial waters (SNH & JNCC, 2012), which included identifying sites as MPA proposals and MPA search locations. The export cable corridor passes through the southernmost parts of the Southern Trench MPA search location which has been identified for the benthic habitats of burrowed mud seabed habitat alongside other marine mammals and geological features (Figure 9-2).

7.3 Baseline environment – commissioned surveys and data analysis

SWL commissioned MMT to conduct an offshore benthic survey in August and September 2013. The survey was conducted alongside the geophysical survey and was designed to characterise and map the benthic environment (habitat and community types) within the Exclusivity Area, proposed AfL Area and along the export cable route corridor. All work was subtidal and boat based. Side-scan sonar and bathymetry data from the geophysical survey was interpreted on-board the vessel to identify ground truth sampling stations for taking high resolution video, stills imagery and benthic grabs as part of a stratified random sampling design. Grab samples were taken and will be analysed to provide data on macrobenthos community and physical nature of the sediments within the whole of the Exclusivity Area, proposed AfL Area and along the export cable route corridor. Analysis of sediment chemical composition will only be undertaken for samples obtained along the export cable route corridor.

In addition in August 2013, Xodus undertook a Phase 1 intertidal biotope survey of the intertidal area located within the landfall area of search. This survey was carried out in accordance with the Marine Intertidal Phase 1 Biotope Mapping Survey methodology as described by Wyn *et al*. (2000).

7.4 Data and information gaps

No data or information gaps are expected on the basis that the surveys outlined in Section 7.3 will suitably characterise the benthic and intertidal environment in the Exclusivity Area, proposed AfL Area and export cable route corridor.

7.5 Identification of potential impacts

Potential impacts and potential significance of those impacts on benthic and intertidal habitats are considered in Table 7-3 below.

Table 7-3 Potential significance of potential impacts on benthic and intertidal habitats

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Direct loss of, and disturbance to, seabed and intertidal habitats and communities	Med	Med	Med	The installation, operation and decommissioning of mooring anchors and installation and decommissioning of inter-array and export cable to shore has the potential to disturb and damage existing habitats and communities in the area.	Yes

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Indirect effects on seabed habitats and communities due to changes in sediment transport /scouring within the Pilot Park	Low	Med	Low	As noted in Section 10.5 due to wave depths in the Buchan Deep it is unlikely that changes to the wave and current climate will affect the seabed. However, there is potential for localised effects on the seabed and benthic habitats due to scouring around anchors, mooring lines and inter-array cables. There will be no indirect impacts on benthic habitats along the export cable route as the cable will be buried.	Yes
Colonisation of infrastructure in the water column and on the seabed	No impact	Positive	No impact	The presence of infrastructure in the water column and on the seabed has the potential to have a positive effect on benthic species and habitats as it provides a hard surface for species to colonise.	Yes
Protection of benthic habitats within the Pilot Park due to restricted trawling in the Pilot Park	No impact	Positive	Low	The restriction / closure of the Pilot Park to fishing vessels with mobile gear (trawlers) could potentially have a positive effect on benthic habitats in the area. This will be assessed in more detail in the ES.	Yes
Introduction of marine non-native species	Low	Low	Low	Although there is potential that vessels used during the Project, and ballast contained within the WTG Unit substructures (if emptied) may potentially bring in non-native species to the area which can be harmful to existing habitats and species, appropriate measures and procedures will be followed with regard to the discharge of ballast minimising the likelihood of any significant impacts on benthic communities.	No
Pollution due to leaks and spills from vessels / WTG Units	Low	Low	Low	Due to the small scale of the Project, limited number of vessels involved during construction and O&M and fact that the WTG Units will be installed pre-assembled, potential sources of pollution are limited and significant impacts on benthic and intertidal habitats are unlikely. Construction industry good practices and procedures will be followed and appropriate emergency procedures will be put in place.	No
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

7.6 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown (Table 7-4).

Table 7-4 Impact assessment strategy for benthic and intertidal habitats

Potential impact	Assessment method	Relevant guidance
Direct loss of and disturbance to seabed and intertidal habitats and communities	Impact assessment study looking at the results of the benthic ecology surveys and physical processes and sediment dynamics impact assessment to determine the extent and significance of any potential impacts on benthic and intertidal habitats and communities.	OSPAR, 2006. Review of the Current State of Knowledge on the Environmental Impacts of the Location, Operation and Removal/Disposal of Offshore Wind-Farms. Publication Number: 278/2006. OSPAR, 2008. Assessment of the environmental impact of offshore wind-farms. Publication Number: 385/2008. Cefas 2004 Guidance Note for Environmental Impact Assessment in Respect of FEPA and CPA Requirements. Ware & Kenny 2011. Guidelines for the Conduct of Benthic Studies at Marine Aggregate Extraction Sites (2nd Edition). Marine Aggregate Levy Sustainability Fund. IEEM 2010 Guidelines for Ecological Impact Assessment in Britain and Ireland. Marine and Coastal.
Indirect effects on seabed habitats and communities due to changes in sediment transport /scouring within the Pilot Park		
Colonisation of subsea infrastructure, scour protection and support structures		
Protection of benthic habitats within the Pilot Park due to restricted trawling in the area		

8 FISH AND SHELLFISH ECOLOGY

This section considers the assessment of the potential impacts to both fish and shellfish. Shellfish are sometimes considered as part of the assessment on benthic ecology because the impacts to shellfish are more akin to those experienced by other benthic species than those experienced by fish species. However, consultations with commercial fisheries stakeholders (Section 13) have considered both fish and shellfish together. Therefore to maintain consistency between commercial fisheries and fisheries ecology sections, fish and shellfish will be considered together within the ecological assessment.

8.1 Assessment strategy

8.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on fish and shellfish ecology will be based on the following:

Table 8-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 8.2
	Consultation	Section 8.3
	Data from benthic and ESAS surveys	Section 8.3
Impact assessment	Assessment of impacts based data obtains from desk based study, consultation, supplemented by additional data collected during the benthic and ESAS surveys	Section 8.6

8.1.2 Justification for proposed assessment strategy

It is not proposed that fish surveys will be carried out as part of the Hywind Scotland Pilot Park Project EIA. This is because the collation and review of existing data (Section 8.2) that is readily available and additional information collected during consultation with local fishermen will be sufficient to determine the fish species present in the the proposed AfL Area and export cable route corridor and identify potential impacts on fish and shellfish. In addition, any observations of fish species made during the ESAS survey (e.g. basking sharks) and the benthic survey (e.g. sandeels collected in the grab samples) will provide additional information to supplement the desk based review and consultation.

8.2 Baseline environment – desk based study

8.2.1 Sources of baseline data

As part of the desk based study for the fish and shellfish ecology assessment, baseline data and information will be collected from the following sources:

Table 8-2 Baseline data sources (excluding surveys)

Type / description of data	Source	Status
Species which utilise the proposed AfL	Coull *et al.*, 1998 and Ellis *et al.*, 2012	Collected – see high level baseline

Type / description of data	Source	Status
Area and export cable corridor including: > Over-wintering areas for crustaceans such as lobster/crab > Species which use the area for spawning/nursery grounds	spawning/nursery ground data MarLIN NBN gateway North East Scotland Biological Records Centre (NESBReC)	description below
> Species with restricted geographical distribution which may be locally abundant > Migratory movements and behaviour of species within the area > Species of fish/shellfish which are of significant importance to recreational and commercial fisheries > Fish and shellfish of conservation importance, including those protected under the Wildlife and Countryside Act and their seasonal sensitivities	Consultation with local fishermen (confirmation of presence, absence, seasonality) Buchan Inshore Fisheries Group Scottish Fishermen's' Federation Local Fishermen's Association Marine Scotland Science – fish landings data and tagging project	To be collected as part of EIA

8.2.2 Desk-based review of existing information

Diadromous fish

Diadromous fish are species of fish which spend part of their life at sea, but migrate up rivers in order to breed. These include Atlantic salmon *Salmo salar,* trout *Salmo trutta* and European eel *Anguilla Anguilla.*

Tagging and recapture studies (reviewed by Malcolm *et al.,* 2010) indicate that the coastal migratory route of Atlantic salmon along the Scottish east coast occur in mostly a northerly direction, with fish from north east England migrating to the north Aberdeenshire coast. Atlantic salmon are listed on Annexes II and V of the European Union's Habitats Directive and the rivers Dee, Spey and South Esk have all be designated as SACs for their Atlantic salmon populations. Potential effects of the project on these SAC populations will also be considered as part of the HRA (Section 21). In addition the River Ugie, directly to the north of Peterhead has been identified as river with an Atlantic salmon population (Kemp *pers comm*, Marine Scotland Fisheries Officer (June 2013)), and is designated as a 'Salmonid River' under the EU Freshwater Fish Directive (78/659/EEC). The North East Scotland Biological Records Centre (NESBReC) has one record of Atlantic salmon at the mouth of the River Ugie.

NESBReC also has recorded of trout and European eel in the mouth of the River Ugie. These records (individual) reflect findings from other tagging studies which indicate that both species are present in waters off the east coast of Scotland.

Sea lamprey *Petromyzon marinus* are listed on Annex I and V of the Habitats Directive. Although not a true fish, they have a diadromous lifecyle where they spawn in freshwater streams and mature in the open sea. Sea lamprey is not typically found in offshore waters around Scotland (main UK population is in the Bristol Channel). However, the species has been recorded in the River Dee (Aberdeen) and the River Spey (north of the Project) is designated as an SAC for its sea lamprey population.

Elasmobranchs

Elasmobrachs are fish species which include sharks, rays and skates. All elasmobranchs are cartilaginous fishes, whose skeletons are composed of cartilage, rather than bone. These animals are collectively referred to as elasmobranchs because they are in the Class Elasmobranchii.

Shark species expected to be present in the proposed AfL Area and along the export cable route corridor include basking shark *Cetorhinus maximus,* tope *Galeorhinus galeus,* spurdog *Squalus acanthias,* lesser spotted dogfish *Scyliorhinus canicula* and porbeagle *Lamna nasus,* kitefin *Dalatias licha*, shortfin mako *Isurus oxyrinchus*, blue *Prionace glauca* and nurse hound *Scyliorhinus stellaris* (Faber Maunsell, 2007, MarLIN www.marlin.ac.uk).

The basking shark is the second largest fish in the world and the largest to be found in British waters. It is protected under the Wildlife and Countryside Act 1981, the Countryside and Rights of Way Act 2000 and under Appendix II of the Convention on International Trade in Endangered Species. In the summer months deeper waters of the coast of Scotland are one of its favoured feeding grounds (The Wildlife Trust, 2010). Although larger shoals do occur, the majority of sightings are of solitary animals and the number of sightings peak in August (Nicholson, 2000). Basking sharks are more commonly sighted off the northern and western Scottish coasts; however there have been occasional sightings off the coast of Peterhead (Bloomfield & Solandt, 2008).

The main species of skate and ray on the east coast of Scotland are spotted ray *Raja montagui* and common skate *Diptursu batis*-complex.

Other finfish and shellfish

It has been estimated that Scottish waters sustain 250 commercial and non-commercial fish species, with 166 species found in the waters off north-eastern Scotland (Barne *et al*., 1996). Consequently a number of different species of fish and shellfish are likely to be encountered in the vicinity of the Project. The Buchan Deep supports commercially important fish species such as mackerel *Scromber scrombus* and sandeel Ammondytidae (see Section 13). These species are also likely to be an important food source for birds and mammals in the area.

The inshore waters close to Peterhead also support commercially important shellfish resources, namely brown crab *Cancer pagurus*, velvet swimming crabs *Necora puber,* lobster *Homarus gammarus* and scallops (see Section 13).

Nursery and spawning grounds

The proposed Project is located within spawning and nursery grounds for numerous fish species of commercial and / or conservation important. These will be evaluated in more detail as part of the EIA to understand if and how they may be affected by the Project.

8.3 Baseline environment – proposed surveys and data analysis

No dedicated fish surveys are proposed. However, basking shark observation data collected as part of the ESAS surveys (Section 6) and fish and shellfish species observed during the benthic survey (Section 7.3) will be used to further supplement the baseline developed from the desk based review and consultation and subsequently inform the assessment of effects on fish and shellfish

The benthic survey was not designed to specifically collect baseline information on the fish species present in the Exclusivity Area, proposed AfL Area and export cable route corridor, however should fish and shellfish species be observed during the survey, such as in the video or stills images or collected during the benthic grab samples they will be identified to the lowest practicable taxonomic level.

8.4 Data and information gaps

No data gaps are expected on the basis that a comprehensive desk based review and consultation with local fishing groups, alongside any supplementary information from the ESAS and benthic surveys will be enough to suitably determine the fish and shellfish species present in the proposed AfL Area and export cable route corridor.

8.5 Identification of potential impacts

Potential impacts and the potential significance of those impacts on fish and shellfish are considered in the Table 8-3 below.

Table 8-3 Potential significance of potential impacts on fish and shellfish

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Noise disturbance	Med	Low	Low	There is potential for noise from vessels involved in WTG Unit installation and installation of the export cable (trenching / HDD activities) to disturb fish especially hearing specialists such as herring and sprat and Atlantic salmon. In terms of vessel noise this is likely to be minimal due to the small scale of the Project and fact that WTG Unit will be installed pre-assembled involving a small number of vessels. However, there is potential for noise generated during cable installation to affect Atlantic salmon associated with the River Ugie.	Yes
Electromagnetic effects (EMF)	Low	Med	No impact	There is potential for subsea and mid water column cables to generate electromagnetic fields (EMF) which could affect the behaviour, distribution and abundance of teleost fish (e.g. salmonids, flat fish and gadoids) and elasmobranches. Although potential impacts from the export cable will be limited on the basis that the cable will be buried, further information relating to the potential effects of the cable on fish and shellfish will be provided in the ES.	Yes
Loss of spawning and nursery grounds	Low	Med	Low	Physical presence of the WTG Units including moorings, anchors and inter-array cables may disturb important spawning and nursery grounds in the Buchan Deep.	Yes
Entanglement risk for large fish species	No impact	Unknown	No impact	There is currently limited understanding of potential effects on large fish from entanglement with mooring lines. Therefore this will require further assessment in the EIA.	Yes
Smothering of fish habitat	Low	Low	Low	Physical presence of seabed infrastructure such as moorings, cables and anchors may disturb, smother and displace crustacean and demersal species, including displacement of available prey to other fish species. However, given the small scale of the proposed project and the short term nature of any potential impacts, the significance of the potential impacts from the smothering of fish habitat is considered to be low.	No

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Fish aggregating potential of development	No impact	Positive	No impact	Possible positive effect of physical presence of WTG Units as the area may be utilised by fish species as a nursery/shelter/spawning area.	Yes
Pollution due to leaks and spills from vessels / WTG Units	Low	Low	Low	Due to the small scale of the Project, limited number of vessels involved during construction and O&M and fact that the WTG Units will be installed pre-assembled potential sources of pollution are limited and significant impacts on fish and shellfish are unlikely. Construction industry good practices and procedures will be followed and appropriate emergency procedures will be put in place.	No
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

8.6 Approach to the assessment of impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown.

Table 8-4 Impact assessment strategy for fish and shellfish

Potential impact	Assessment method	Relevant guidance
Noise disturbance from WTG Unit and export cable installation activities	Desk based assessment to investigate how the Project might impact the species present in the area including a review of the noise and electromagnetic outputs of the Project infrastructure and utilisation of the benthic ecology survey to assess potential implications of altering the fish habitat. Due to the limited sources of underwater noise (low vessel numbers, no piling etc.) it is unlikely that noise modelling will be required to inform the ES. The assessment of effects in relation to underwater noise will be based on the data collected from the Hywind Demo turbine (see Section 9).	COWRIE 'Effects of offshore wind farm noise on marine mammals and fish' publication. Literature on the current research of EMF on fish and shell fish e.g. Normandeau (2011) Woodruff, *et al.* (2012) CMACS (2003) Cowrie (2009a), Gill and Bartlet (2010), Gill *et al.* (2005; 2009; 2012). Cefas 2004 Guidance Note for Environmental Impact Assessment in Respect of FEPA and CPA Requirements.
Electromagnetic effects (EMF)		
Loss of spawning and nursery grounds		
Entanglement risk with mooring lines for large fish species		
Fish aggregating potential of development	Desk based study including review of current research into positive effects of offshore wind farms in relation to fish aggregation.	

9 MARINE MAMMALS AND TURTLES (INCLUDING MARINE NOISE)

9.1 Assessment strategy

9.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on marine mammals and turtles will be based on the following:

Table 9-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 9.2
	Marine mammals observations from ESAS surveys (see Section 6: Ornithology)	Section 9.3
Impact assessment	Assessment of impacts based data obtains from desk based study, consultation, supplemented by additional data collected during the benthic and ESAS surveys	Section 9.6

9.1.2 Justification for proposed assessment strategy

The proposed approach to the collection of marine mammal data reflects the fact that:

> The key impact mechanism associated with offshore wind installations (pile driving) will be absent for the Project;

> Vessel activity during WTG Unit installation is also expected to be minimal due to the size of the Project (up to five WTG units) and installation method (WTG Units will be pre-assembled elsewhere before installation); and

> A review of noise monitoring data collected from the existing Hywind Demo Project, Stavanger (Document Ref: A-100142-S00-TECH-003; Appendix D) found noise levels generated during operation of the turbine to be negligible.

This approach was discussed further during a pre-screening / scoping meeting with Marine Scotland, JNCC, SNH and Aberdeenshire Council held on 14th June 2013. During this meeting it was agreed that, due to the size of the Project and fact that there will be no pile driving, data from marine mammal observations carried out during the ESAS surveys would be sufficient to inform characterisation of marine mammal abundance and distribution in the proposed AfL Area . Further agreement to this approach was provided in SNH and JNCC's responses to the Project Briefing Letter (17th July 2013) and Seabird Discussion Document (Xodus 2013a, 2nd September 2013) where it was noted that '...it will be sufficient for marine mammals to be addressed in the EIA using observational data during the ornithological [ESAS] surveys, alongside existing information and on-going strategic research'.

It was also agreed that, due to there being limited sources of potential impacts on marine mammals it would not be necessary to use towed hydrophones as these have not been required for previous assessments that have also been based on existing data only. It was also noted that not all species of marine mammal vocalise frequently in Scottish waters e.g. minke whales and therefore would not be detected by hydrophones.

The baseline data review and subsequent impact assessment will therefore be based on existing datasets and on supplementary marine mammal observations made during the ESAS surveys (see Section 6). This information will also be used to inform the assessments of potential effects on SACs as part of HRA (See Section 21).

9.2 Baseline environment – desk based study

9.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects on marine mammals and turtles, baseline data and information will be collected from the sources identified in Table 9-2.

Table 9-2 Baseline data sources (excluding surveys)

Type / description of data	Source	Status
Marine mammal distribution and abundance Data on marine mammal behaviour and responses to marine developments and activities	New JCP cetacean distribution data (publication pending) Underwater noise measurements from Hywind Demo deployment and operation Modelled seal density maps (Jones *et al*., 2013) Atlas of cetacean distribution in north-west European waters (Reid *et al*., 2003) Data from the Sea Mammal Research Unit SCANS (Small Cetacean Abundance in the North Sea) and SCANS-II (Small Cetacean Abundance in the European Atlantic and North Sea) surveys	To be collected and reviewed in detail as part of the EIA. Collected – see high level baseline description below.

9.2.2 Desk-based review of existing information

Cetaceans

The JNCC Atlas of Cetacean Distribution in North West European Waters (Reid *et al*., 2003) provides data on sightings of cetacean species found in north-west European waters. These data are a combination of 'sightings' records and 'effort' records from the following three data-sets:

- The JNCC Seabirds at Sea Team (SAST);
- The UK Mammal Society Cetacean Group, subsequently forming the Sea Watch Foundation; and
- The Sea Mammal Research Unit (SMRU) who co-ordinated the European Community-funded SCANS and SCANS-II surveys.

It is also worth noting that Joint Cetacean Protocol (JCP) is currently completing a new initiative which uses a modelling approach to analyse the data sources in the JNCC Atlas and substantial data from new providers, to generate improved predictions of offshore distributions for cetaceans in UK waters. The report which was originally due for publication in April 2013 is currently undergoing peer review and it is assumed that this information will be available for inclusion in the EIA and add to the data presented in this Scoping Report and collected during the ESAS surveys.

The JNCC Cetacean Atlas provides data on sightings of cetacean species found in north-west European waters. For each species of cetacean described in the atlas information is presented that includes a species descriptor, the number of individuals thought to be present in UK waters and wider area and other relevant details on behaviour, group size etc. This dataset has been reviewed as part of this Scoping Report to highlight which cetacean species are likely to be found within the Hywind Scotland Exclusivity Area, proposed AfL Area and surrounding waters.

The surveys' results indicate that the white-beaked dolphin *Lagenorhynchus albirostris*, harbour porpoise *Phocoena phocoena* and minke whale *Balaenoptera acutorostrata* are the species most commonly observed within

the Exclusivity Area and proposed AfL Area (Figure 9-1). The Atlantic white-sided dolphin *Lagenorhynchus acutus*, bottlenose dolphin *Tursiops truncatus*, fin whale *Balaenoptera physalus*, humpback whale *Megaptera novaeangliae*, killer whale *Orcinus orca* and Risso's dolphin *Grampus griseus* have been encountered in the surrounding waters; Other cetacean species that were sighted in close vicinity to the Exclusivity Area and proposed AfL Area are the pygmy sperm whale *Kogia breviceps*, common dolphin *Delphinus delphis*, long-finned pilot whale *Globicephala melas* and some beaked whale species.

Based on the information provided on the seasonal distribution of certain cetacean species, species are more frequently sighted nearshore in the summer months. However, whether this is a real indication of seasonal movements or a function of survey distribution is currently unclear. It should be noted that fin whale, pygmy sperm whale and long-finned pilot whale are not expected to be present on a regular basis in the Exclusivity Area and proposed AfL Area as they generally occur mainly in deep oceanic water beyond the edge of the continental shelf. This is similar for the beaked whales whose diet primarily consists of deep-water squid species.

Seals

There are two species of seals that live and breed in UK waters, the grey seal *Halichoerus grypus* and harbour seal *Phoca vitulina*. Other species of pinnipeds are intermittently sighted in UK waters, including the Arctic species; ringed seal *Phoca hispida*, harp seal *Phoca groenlandica*, bearded seal *Erignathus barbatus* and hooded seal *Cystophora cristata* (SCOS, 2012).

Grey seals haul-out at all times of the year to rest from foraging and other activities, but the maximum number at haul-outs is seen in the moulting period between late winter and spring (SCOS, 2012). Grey seals can feed up to several hundreds of miles offshore and in water depths of up to 100 m. From satellite tracking of individual seals it seems that grey seals often use specific haul-out sites and will travel far to reach them. The number of grey seals in the Exclusivity Area and proposed AfL Area is predicted (on an annual basis from telemetry data spanning 1991 to 2012) to be low as 0.12 animals per km^2 (Jones *et al*., 2013).

Approximately 45% of the world's grey seals live in the water around the UK with 90% of them breeding in colonies in Scotland. Haul-out sites for grey seals on the coastline of the east of Scotland are less numerous than Orkney, Shetland and the west coast, although a number of haul-out sites are aggregated along the coastline close to Peterhead (SCOS, 2012). The number of grey seals at sea close to Peterhead is predicted (on an annual basis from telemetry data spanning 1991 to 2012) to be 1.9 animals per km^2 (Jones *et al*., 2013).

Approximately 30% of European harbour seals are found in UK waters; Scotland has approximately 85% of the UK's population. The closest concentration of harbour seals to the Project is in the Moray Firth estuary. Information on the distribution of harbour seals at sea has been collected during various aerial and marine survey efforts, but most information on movements and offshore distributions and behaviour has come from satellite telemetry on tagged animals. Thompson *et al*. (1996) report foraging activity of tagged seals in the Moray Firth to be limited to 60 km from haul-out sites, with little exchange between geographically separated populations. Similar findings have been reported for other Scottish populations (e.g. Cunningham *et al*., 2009). Scottish harbour seals have suffered major declines in recent years with populations in the Moray Firth declining by 46%, Orkney by 66% and the Firth and Tay by 84%. The cause of these declines is still being investigated.

There are few haul-out sites for harbour seals on the coastline in the Aberdeenshire area and only a small number have been identified from thermal imaging surveys (SCOS, 2012). The number of harbour seals at sea close to Peterhead is predicted (on an annual basis from telemetry data spanning 1991 to 2012) to low at 0.04 animals per km^2 (Jones *et al*., 2013). In winter months, harbour seals tend to spend a greater proportion of time foraging and the number of harbour seals in the Exclusivity Area and proposed AfL Area is predicted (on an annual basis from telemetry data spanning 1991 to 2012) to low at 0.003 animals per km^2 (Jones *et al*., 2013). The breeding season for harbour seals is late May to early July when the animals soon moult after this (August). They spend the greatest proportion of time ashore during the moult and this is when population counts are conducted from helicopters using thermal imaging (SCOS, 2012).

Marine mammal conservation

All cetaceans are in Annex IV of the Habitats Directive and as such designated as EPS. This designation means it is an offence to intentionally or recklessly kill, injure or capture cetaceans or to disturb or harass them. In addition, harbour porpoises and bottlenose dolphins and both grey and harbour seals are Annex II species for which SACs should be established. Being highly mobile species with no discrete breeding or resting locations, cetaceans have been considered likely to benefit little from the establishment of small protected areas such as SACs. As a result, only two cetacean species have been included on Annex II (bottlenose dolphin and harbour porpoise) and, thus far, there has only been one SAC established in Scotland (Moray Firth, for bottlenose dolphin; see below). There are a further 14 SACs which have been primarily selected for marine mammals; six are for the grey seal and eight are for the harbour seal. Potential effects of the Project on these SACs will also be considered as part of the HRA.

In UK territorial waters, there are two semi-resident groups of bottlenose dolphin. One is situated in Cardigan Bay, west Wales, and is consequently of no direct interest to this Project. The other, however, covers much of the Inner Moray Firth (Figure 9-2). The population in the Moray Firth is estimated to be around 130 individuals (Wilson *et al.*, 1999). Since the mid-1990s, the population has increasingly been shown to make movements further eastwards and southwards past the Exclusivity Area and proposed AfL Area. Whilst some SAC animals may range further afield throughout the year, bottlenose dolphins are recorded as present throughout the year in the Moray Firth, with the same individuals having been seen over a number of years. The most recent estimate for the entire east coast population of bottlenose dolphins is 195 animals (Cheney *et al.*, 2013).

The Moray Firth SAC is designated for for harbour porpoises. The estuary has a high degree of water mixing which results in high biological productivity, reflected in increased populations of small prey fish. One of the key areas appears to be the Smith Bank in the north-west of the Firth (SMRU, 2012). The Moray Firth has also been identified as a SAC for grey and harbour seals, based on breeding colony size and on pup production estimates. The Moray Firth is important both as a general haul-out site and for moulting and pupping for these species (as evidenced by the five haul-outs included in the Scottish Government's designated seal haul-out consultation; Scottish Government, 2011).

Within the Moray Firth, The Dornoch Firth (and Morrich More SAC) is the most northerly large estuary in Britain and supports a significant proportion of the inner Moray Firth population of harbour seal. The seals use sand-bars and shores at the mouth of the estuary for haul-out and breeding sites. The population found at Dornoch Firth is around 2% of the UK population. The Firth of Tay and Eden Estuary is an SAC for harbour seals and the Isle of May an SAC for grey seals. The Berwickshire and North Northumberland Coast is also an SAC for grey seals. Within Orkney there is an SAC for grey seals at Faray and Holm of Faray, and for common seals on Sanday. Grey seals have been shown to move considerable distances and likely move between many of these SAC sites and to other haul-outs as well (McConnell *et al.,* 1999).

The Marine (Scotland) Act 2010 and the Marine and Coastal Access Act (2010) new powers have been established to designate MPAs in Scottish territorial and UK offshore waters, including Scotland. As previously highlighted, the export cable corridor passes through the southernmost parts of the Southern Trench MPA search location identified for minke whale and white-beaked dolphin alongside benthic habitats and geological features (Figure 9-2).

Turtles

Five species of marine turtle have been recorded in the UK and Irish waters; leatherback turtle *Dermochelys coriacea*, loggerhead turtle *Caretta caretta*, Kemp's ridley turtle *Lepidochelys kempii*, hawksbill turtle *Eretmochelys imbricata* and the green turtle *Chelonia mydas*. The leatherback turtle is the only species that is reported annually (DECC, 2009), and have been recorded very occasionally in the North Sea. For the whole of the UK and Irish waters 51 were sighted (dead and alive) in 2011 (Penrose & Gander, 2012), of which none were sighted near the Exclusivity Area and proposed AfL Area. The leatherback turtle is protected under UK legislation.

9.3 Baseline environment – proposed surveys and data analysis

9.3.1 Surveys

It is proposed that dedicated marine mammal surveys are not undertaken for this Project. However, monthly ESAS surveys are being undertaken at the site, which include the recording of marine mammals. As such, site-specific information on species occurrence and temporal variation will be available for the proposed AfL Area These data will be analysed as described in Section 9.3.2 below and used to inform the assessment of effects on marine mammals and turtles.

9.3.2 Data analysis

The marine mammal observation data collected as part of the ESAS surveys will be analysed and utilised in EIA. It is recognised that due to the behaviour and encounter rate of marine mammals the ESAS methodology is not considered the most appropriate survey design for dedicated marine mammal surveys. However, the lack of impact mechanism from the proposed Hywind Scotland Pilot Park Project means that the certain output from dedicated marine mammal surveys is not critical to the assessment; relative or absolute density estimates for the Exclusivity Area and proposed AfL Area are not considered necessary, especially when appropriate proxy measures (as presented in the baseline above) are available. The information such as species occurrence and temporal variation in that occurrence (i.e. which species are sighted and at which time of the year) collected during ESAS bird surveys will provide a suitable method of ground-truthing the regional and alternative data presented above. The marine mammal data collected by the ESAS bird surveyors will be analysed to produce:

- Species occurrence (i.e. sightings numbers);
- Temporal variation in species occurrence (i.e. sightings numbers broken down by month); and
- Sightings distribution maps.

9.4 Data and information gaps

Having reviewed the currently available data and that to be collected during the bird surveys, there are considered to be no data gaps with regards to baseline data. On the basis of the deployment of novel technology, it is recognised that some of the potential impacts are novel (e.g. entanglement risk) and may not be fully understood. These areas of potential uncertainty will therefore need to be considered further within the EIA.

9.5 Identification of potential impacts

Potential impacts and the potential significance of those impacts on marine mammals and turtles are considered in Table 9-4 below.

Table 9-3 Potential significance of the potential impacts on marine mammals and turtles

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Corkscrew injuries	Med	Med	Med	Due to the low number of vessels involved in WTG Unit installation and O&M activities the potential for impacts on marine mammals as a result of corkscrew injuries is limited. However, due to the declining status of the harbour seal population in Scotland and their vulnerability to corkscrew injuries, these impacts will need to be assessed further in the EIA.	Yes

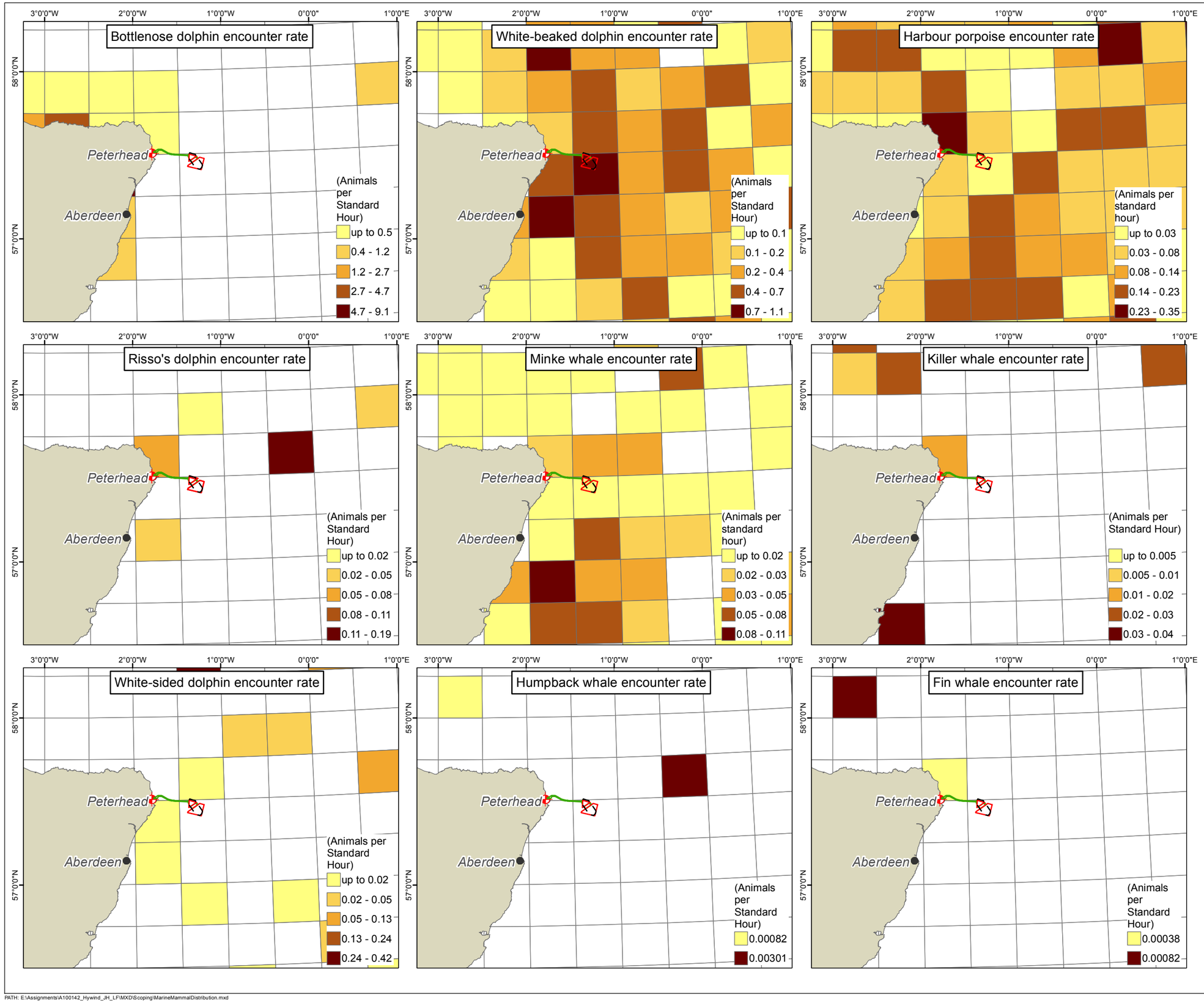
Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Marine mammal entanglement	No impact	Unknown	No impact	There is currently limited understanding of potential effects on marine mammals from entanglement with mooring lines. Therefore this will require further assessment in the EIA.	Yes
Indirect effects from changes in habitat and distribution / abundance of prey species	No impact	Med	No impact	There is potential that the Pilot Park could have a localised effect on foraging activities within the Buchan Deep either as a result of changes in prey abundance and distribution or due to changes in the foraging habitat due to the physical presence of the WTG Units. Although the existing data on marine mammal distributions indicates that these indirect effects are unlikely to be significant, further assessment will be required to confirm this once the ESAS surveys are complete and more information is available other EIA topics e.g. fish and shellfish.	Yes
Noise disturbance	Med	Low	Med	As discussed previously, the potential for noise disturbance from vessels during WTG Unit installation and noise to be generated during WTG Unit operation (tonal operational noise of WTG Unit and snapping sound potentially from the mooring cables) is limited due to the small scale of the Project (up to five WTG Units), low numbers of vessels involved in installation and limited on-site activity (WTG Units to be installed pre-assembled). However, marine mammals are known to pass through / be present in the proposed AfL Area. Therefore these impacts will need to be assessed further in the EIA. There is also potential for temporary effects on marine mammals from noise generated during export cable installation and activities at the landfall (open trenching or HDD).	Yes
Pollution due to leaks and spills from vessels / WTG Units	Low	Low	Low	Due to the small scale of the Project, limited number of vessels involved during construction and O&M and fact that the WTG Units will be installed pre-assembled potential sources of pollution are limited and significant impacts on marine mammals are unlikely. Construction industry good practices and procedures will be followed and appropriate emergency procedures will be put in place.	No
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

9.6 Approach to the assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown (Table 9-4).

Table 9-4 Impact assessment strategy for marine mammals and reptiles

Potential Impact	Assessment method	Relevant guidance
Corkscrew injuries	Data collected as part of the ESAS surveys will be processed and analysed in order to determine which species of marine mammal are present in the proposed AfL Area and determine the distribution and abundance of each species. Results from the data analysis combined with information from the marine mammal and turtle desk study will be used to inform a desk based assessment of potential impacts. The impact assessment will also be based on information relating to the knowledge of specific species, operation of WTG Units, and anecdotal evidence regarding the potential for entanglement.	The JNCC/SNH guidance note on ship strike (corkscrew injury). Potential forthcoming SNH advice note on entanglement risk. The Scottish Government advice note on displacement of marine mammals around operational offshore windfarms. SNH entanglement study (when available).
Entanglement risk for marine mammals		
Indirect effects from changes in habitat and distribution / abundance of prey species		
Noise disturbance from installation and O&M vessels, cable installation and WTG Units operation	The potential for underwater noise disturbance from vessels, cable installation and the operation of WTG Units will be investigated further. This could include underwater noise modelling, based on the data collected from the Hywind Demo. An initial review of data collected from Hywind Demo by Xodus (2013c) and Appendix D indicates that the potential disturbance to marine mammals resulting from the operational tonal noise of the WTG Units will not be significant. In addition, an initial review of data collected on the snapping sound, attributed to the mooring cables used in Hywind Demo indicates that this is also unlikely to result in significant injury to marine mammals. Subject to further consultation potential requirements for modelling to verify the assessment of potential impacts and inform EIA will be identified.	The collaborative 'framework for consenting offshore wind farms in Scotland'. The COWRIE 'Effects of offshore wind farm noise on marine mammals and fish' publication.



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation

Note: Standard hour is a standardised unit refering to number of animals sighted per hour of surveying.

0 10 20 30 40 nm

0 20 40 60 80 100 km

N

TITLE:

Figure 9.1
Distribution of marine mammal species

CLIENT: Statoil

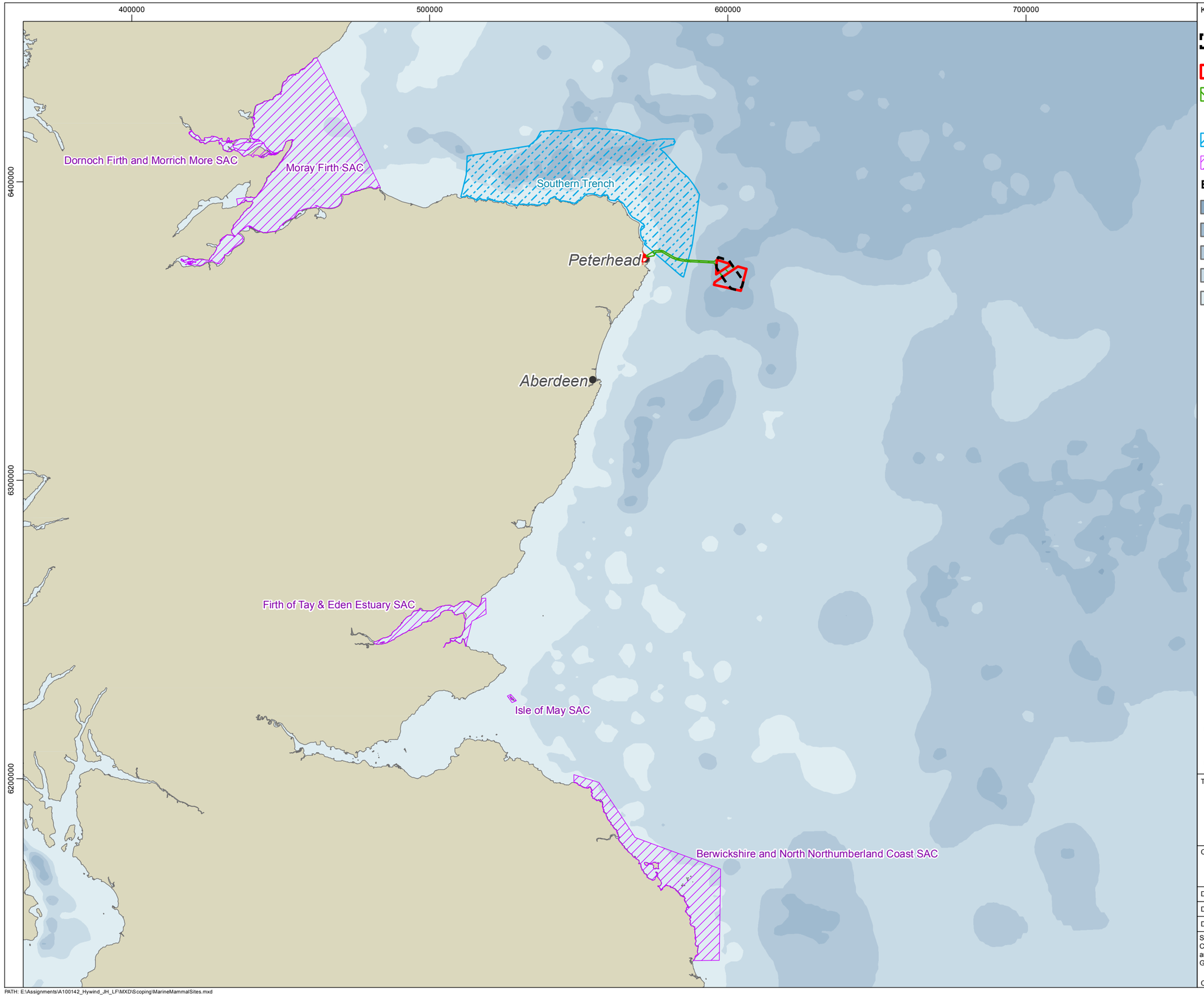
DATE: 30/09/2013	SCALE:1:2,500,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: MarineMammalDistribution.mxd			A01

SOURCE: Contains Ordnance Survey data
© Crown copyright and database right 2013
JNCC

COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\MarineMammalDistribution.mxd



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation
- MPA Search Location
- Special Area of Conservation

Bathymetry (m)

- 200 - 500
- 100 - 200
- 75 - 100
- 50 - 75
- 0 - 50

0 5 10 15 20 nm

0 10 20 30 40 km

N

TITLE: Figure 9.2
Protected sites on east coast of Scotland with marine mammal interests

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:1,250,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: MarineMammalSites.mxd			A01

SOURCE: Copyright Scottish Natural Heritage
Contains Ordnance Survey data © Crown copyright and database right 2013
GEBCO, Marine Scotland

COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\MarineMammalSites.mxd

10 PHYSICAL PROCESSES AND SEDIMENT DYNAMICS

10.1 Assessment strategy

10.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project in terms of physical processes and sediment dynamics will be based on the following:

Table 10-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study.	Section 10.2
	Data from geophysical survey, geotechnical desk study, ADCP metocean buoy and benthic survey	Section 10.3
	Review of data from other surveys in the wider area	Section 10.3
Impact assessment	Assessment of impacts based on data obtained from desk based study, consultation, standard calculations and supplemented by additional data collected during the geophysical and benthic surveys	Section 10.6

10.1.2 Justification for proposed assessment strategy

The proposed strategy is to carry out a detailed baseline assessment based on a desk based study, supplemented by data from the geophysical and benthic surveys. The Pilot Park is not expected to cause any impacts to coastal processes beyond negligible impacts to sediments from the anchor structures and cables. Many offshore wind farms have carried out numerical modelling of currents and waves as part of their impact assessment, but modelling is not considered necessary to determine the extent of impacts for the Pilot Park.

The proposed strategy has been taken based on the size, design and physical environment of the Project, an understanding of the dominant physical processes at the site, and a review of historical coastal process studies from consented wind farm EIAs.

The following types of impact are typically reviewed in the coastal processes assessment:

- Changes to wave climate;
- Changes to tidal currents;
- Changes to sediment transport and morphology;
- Introduction of scour;
- Effects on the coastline; and
- Cumulative effects from other wind farms.

The inputs and conclusions of the three most recently consented wind farm developments (Triton Knoll, Galloper and Kentish Flats Extension) have been summarised below in Table 10-2, to provide an overview of projects which may be used for comparison. All the project examples are substantially larger developments than the Pilot Park and are located in substantially shallower water (thereby increasing their scope for impacting the seabed), but were all found to cause negligible or no impacts to coastal processes.

Table 10-2 Summary of coastal processes EIA descriptors, inputs and impacts

	Triton Knoll offshore wind farm (RWE npower renewables, 2012)	Galloper offshore wind farm (Galloper Wind Farm Limited, 2011)	Kentish Flats offshore wind farm (Vattenfall, 2011)	Hywind Scotland Pilot Park
Granted consent	July 2013	May 2013	February 2013	Not yet consented
Rated power (MW)	1,500	504	51	30 (maximum)
Number of turbines	Maximum of 333	Maximum of 140	Maximum of 17	Maximum of 5
Water depth (m)	13 to 20	6 to 60	3 to 5	95 to 120
Footprint (km^2)	135	183	8	17.5
Distance from shore (km)	33	27	8	25
Surveys	Detailed metocean surveys: currents, waves, water levels, turbidity	Detailed metocean survey inherited from nearby Greater Gabbard (2005, currents, waves, water levels, turbidity)	Detailed metocean survey inherited from Kentish Flats wind farm (2002, currents, waves, water levels)	Metocean buoy: currents, waves, water levels, turbidity
Modelling	Detailed modelling carried out based on survey results	Detailed modelling inherited from nearby Greater Gabbard (2005)	Detailed modelling inherited from Kentish Flats ES (2002)	None proposed
Summary of predicted impacts	All impacts to coastal processes found to be negligible or no effect	All impacts to coastal processes found to be negligible or no effect	All impacts to coastal processes found to be negligible or no effect	N/A

Based on knowledge of the physical environment of the Buchan Deep site, and supported by the conclusions reached by other comparative studies, it is likely that any potential impacts upon the sediment regime will be small and restricted to the area immediately around the Pilot Park. In addition, the potential impacts upon the hydrodynamic and wave regimes are likely to be insignificant beyond the near-field. Thus there are not likely to be any changes anticipated to the coastal sediment transport pathways along the Aberdeenshire coastline, or any other changes to the coastline. It is therefore proposed that oceanographic modelling will not be required for this Project and that it will be sufficient for the assessment of impacts on physical processes and sediment dynamics to be based on a desk study of historical and available survey data.

10.2 Baseline environment – desk based study

10.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects in relation to physical processes and sediment dynamics, baseline data and information will be collected from the following sources:

Table 10-3 Baseline data sources

Type / description of data	Source	Status
Bathymetry	United Kingdom Hydrographic Office (UKHO) Admiralty Chart data (digital) Site-specific bathymetric survey	Collected – see high level baseline description below Site-specific survey August – September 2013
Geology and offshore sediments	Various British Geology Survey (BGS) charts and digital maps Site-specific geophysical and benthic survey	Collected – see high level baseline description below Site-specific survey August – September 2013
Descriptive current speed and direction, wave and sediment transport information in the vicinity of the Pilot Park	UKHO Tidal Stream Atlas (UKHO, 1986) SNH Coastal Cells in Scotland: Cell 2 – Fife Ness to Cairnbulg Point (Barne *et. al.*, 1996) JNCC Coasts and Seas of the UK: Region 3 North-east Scotland: Cape Wrath to St. Cyrus (Ramsay & Brampton, 2000) Site specific metocean buoy deployed by SWL	Collected – see high level baseline description below Site specific metocean buoy to be deployed October 2013
Quantitative current speed and direction in vicinity of the Pilot Park	British Oceanographic Data Centre (BODC) historical current meter records UK Digital Marine Atlas Project (BODC, 1998) current statistics Atlas of UK Marine Renewable Energy Resources (BERR, 2008) modelled currents Site-specific current meter deployed by SWL	BODC data to be collected as part of the environmental assessment Collected – see high level baseline description below Site-specific current meter to be deployed October 2013
Quantitative wave data in the vicinity of the Pilot Park	WaveNet buoy (Cefas)	To be collected as part of the environmental assessment
Coastal description	Ordnance Survey maps UKHO North Sea Pilot (West) (UKHO, 2013) Site-specific intertidal survey	Collected – see high level baseline description below Site-specific survey August 2013
Coastal and offshore geology and geomorphology	Hywind Geotechnical Desk Study Report (Xodus, 2013d) Hywind Land Site Walkover – Geotechnical Evaluation (Xodus, 2013e) Marine Scotland video tow surveys	Collected – see high level baseline description below

10.2.2 Desk-based review of existing information

Bathymetry

East of Peterhead the sea floor slopes from the coast to 60 m depth by about 5 km, and north to Ratteray Head and south towards Aberdeen the 60 m contour is reached about 10 km offshore.

Further offshore, several narrow and relatively deep (>100 m) troughs occur, the nearest being 17.5 km offshore. The Hywind Scotland Exclusivity Area and proposed AfL Area are situated in the Buchan Deep, approximately 25 km due east of Peterhead, with water depths between 95 to 120 m. See Figure 1-2 for an overview of bathymetry in the Exclusivity Area, proposed AfL Area and along the export cable route corridor.

Tide and wave and wind regime

The flood tidal flow follows the coastline from the Moray Firth around Cairnbulg Point, at which point it meets a southerly flowing stream from offshore. The resulting flood tide runs south, parallel to the coastline. The flood and ebb tides in the region of the project development are strongly rectilinear, with the ebb tide flowing parallel to the coastline towards the north (UKHO, 1986). At Peterhead, the spring tidal range is approximately 3.8 m and the neap is 3.1 m. Tidal currents attain a maximum speed of approximately 1.3 m/s (2.5 knots) during springs (UKHO, 2013).

The wave climate offshore of Peterhead experiences waves from all direction sectors between 0°N and 200°N with a slight bias from between 0°N and 60°N due to the dominance of swell conditions generated in the Norwegian Sea from this sector (Ramsay & Brampton, 2000).

The strength of the winds and the frequency of certain wind directions show considerable variation, although winds are predominantly from the south and west (Ramsay & Brampton, 2000).

Seabed sediment and geology

Seabed sediments along the export cable route corridor and within the Exclusivity Area and proposed AfL Area comprise predominantly superficial deposits of Holocene sands (sometimes gravelly), which generally occur as a very thin veneer blanketing the area (less than 0.5 m). Underlying the veneer, the BGS indicate that the Quaternary soils comprise Forth Formation and Wee Bankie/Witch Ground Formation deposits over Coal Pit Formation. Based on geophysical records, the Quaternary sediments are relatively thin (up to 40 m thick) within the Exclusivity Area and proposed AfL Area where they directly overlie basement bedrock and thin west towards the coast where they completely pinch out (Xodus, 2013d; Figure 10-1).

The basement bedrock underlying the much younger Quaternary deposits comprise a sequence of indurated sedimentary and igneous rock sequences dating between Paleocene and Devonian age. This sequence grows older westward toward the Peterhead coast. The depth to the bedrock interface is irregular, with deep areas lying southeast and northeast of Peterhead. However, directly east of Peterhead in the Exclusivity Area and proposed AfL Area, bedrock is indicated to be within 20 m of the seabed, before dropping away to greater depths east of this point (Xodus, 2013d, Figure 10-1).

Coastal description

The coastline within the landfall area of search comprises rocky cliffs and sand dunes. The cliffs to the south of Peterhead are composed of granite, and are extremely resilient to marine erosion and provide little input of beach material. North of Peterhead towards Rattray Head, the coastline becomes dominated by sand dunes fronted with drift deposits of blown sand (Ramsay & Brampton, 2000).

Around Peterhead the net littoral drift direction is variable, as northward wave-induced drift is generally cancelled-out by southward tidal currents (Barne *et al.*, 1996). Likewise the chief mechanism of erosion of the frontal dunes is episodic storm events rather than long term processes.

Peterhead bay, a deep indentation, is entered between Keith Inch, a promontory, and Salthouse Head, 0.7 mile SW. Peterhead Harbour, an important fishing centre within the bay, is protected by a number of concrete and rock breakwaters which form an entrance 198 m wide and is dredged regularly (annual maintenance dredging).

10.3 Baseline environment – proposed surveys and data analysis

10.3.1 Surveys

No specific surveys are planned. However, data from geophysical, benthic and intertidal surveys (See Section 7.3) will be used as appropriate, along with any supporting data collected for engineering purposes, for instance any current meter data collected to characterise the site for engineering.

In addition, SWL plan to deploy a metocean buoy within the proposed AfL Area for 12 months from October 2012, to collect data on current, waves, water level and turbidity. Some of these data will be available to inform the impact assessment.

10.3.2 Data analysis

The geophysical and benthic survey data will be used to understand the detailed bathymetry of the site and cable route, along with the depth and composition of seabed sediments. The data will also be used to identify large-scale bedforms such as sandwaves and outcrops of bedrock.

Information from the intertidal survey will be used to ensure that the baseline description of the landfall area of search is sufficient.

10.4 Data and information gaps

No data gaps are expected on the basis that all relevant data will be supplied through desk based review and survey.

10.5 Identification of potential impacts

Possible impacts along with the potential significance of effects on the physical processes and sediment dynamics are considered in Table 10-4 below.

Table 10-4 Potential significance of potential impacts on physical processes and sediment dynamics

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Changes to wave climate	Low	Low	Low	The physical presence of the WTG Units is likely to only have a small local effect on the wave climate in the immediate vicinity of the Pilot Park, therefore significant impacts are unlikely.	No
Changes to local currents	No impact	Low	No impact	The physical presence of the WTG Units is likely to only have a small local effect on the currents in the immediate vicinity of the Pilot Park therefore significant impacts are unlikely.	No
Changes to sediment transport and morphology	No impact	Low	No impact	The water depth at the Buchan Deep site (>100 m) means any changes to the wave and current climate will be unlikely to impact the seabed. Therefore only the anchors and cable route are likely to cause any changes to sediment transport and morphology, which will be highly localised and small in nature and are therefore unlikely to be significant in terms of impact on sediment transport and morphology over a wider area.	No

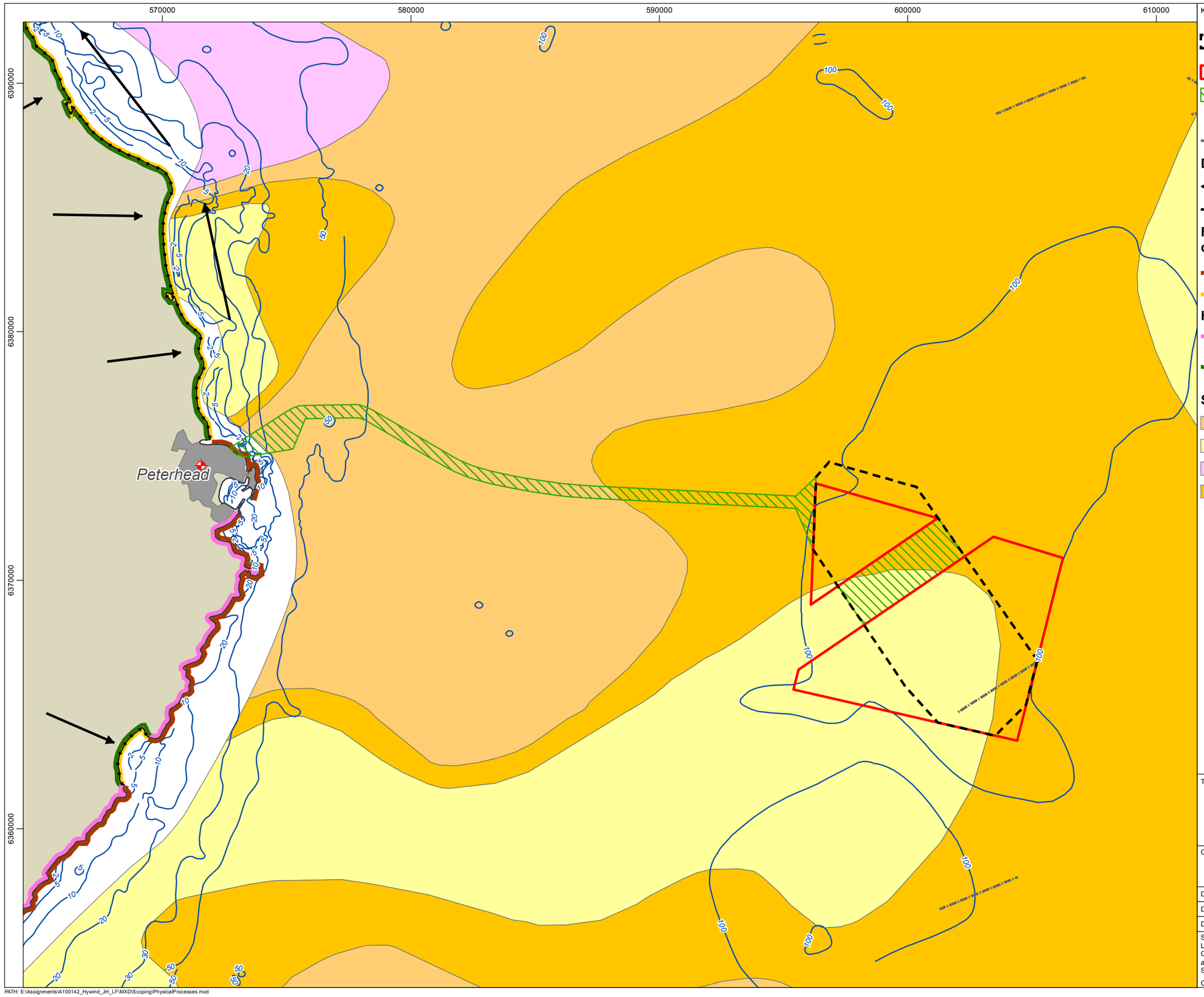
Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Introduction of scour within the Pilot Park	Low	Med	No impact	Where soft seabed sediments are present within the Pilot Park, there is potential for scouring to occur around anchors, mooring lines and inter-array cables. While these potential effects are expected to be highly localised around infrastructure on the seabed, and therefore are unlikely to be significant, further assessment will be required as part of the EIA to confirm these effects and to inform the assessment of potential indirect effects on benthic communities in the development area. Scouring is not likely to occur along the export cable route as the cable will be buried.	Yes
Effects on the coastline at the export cable landfall	Med	Med	No impact	Options for bringing the cable ashore include HDD or open trenching across the foreshore. Where open trenching is required this may involve trenching of beach sediments / rock which may impact beach morphology.	Yes
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

10.6 Approach to the assessment of impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown (Table 10-5).

Table 10-5 Impact assessment strategy for physical processes and sediment dynamics

Potential impact	Assessment method	Relevant guidance
Introduction of scour within the Pilot Park	Baseline current and wave data from the area will be used to establish likely scour depths, using standard equations.	The DECC 'Dynamics of scour pits and scour protection' publication (DECC, 2008). The Cefas 'Offshore Wind Farms. Guidance Note for Environmental Impact Assessment in Respect of FEPA and CPA Requirements' publication (Cefas, 2004). The COWRIE 'Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practise Guide' publication. (COWRIE, 2009b).
Effects on the coastline at the export cable landfall	Impacts will be assessed based on a desk study of available information and the intertidal survey of landfall area of search.	



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation
- Fault

Dominant Littoral Processes

- Sediment Sources (Relict deposits)
- Sediment Sources (Relict deposits)

Foreshore characteristics

- Dominantly Bedrock
- Dominantly Sand

Hinterland characteristics

- Dominantly Cliff (>5m high)
- Dunes (can be overlying raised beaches)

Seabed sediments

- Gravelly sand
- Sand
- Sandy gravel
- Slightly gravelly sand

0 1 2 nm

0 1 2 3 4 km

N

TITLE:

Figure 10.1
Physical processes
and sediment dynamics

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:150,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: PhysicalProcesses.mxd			A01

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SNH RSM No 144

COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\PhysicalProcesses.mxd

11 SEDIMENT AND WATER QUALITY

11.1 Assessment strategy

11.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on sediment and water quality will be based on the following:

Table 11-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 11.2
	Benthic survey which includes sediment chemical analysis along cable route corridor	Section 11.3
Impact assessment	Assessment of impacts based on desk based study and the analysis of sediment chemistry from benthic survey	Section 11.6

11.2 Baseline environment – desk based study

11.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects on sediment and water quality, baseline data and information will be collected from the following sources:

Table 11-2 Baseline data sources

Type / description of data	Source	Status
Existing sediment quality e.g. disposal sites	Cefas, Marine Scotland	Collected – see high level description below.
Bathing waters	SEPA	

11.2.2 Desk-based review of existing information

Sediment quality

There are no known existing or historical releases or deposits on to the seabed within or close to the Exclusivity Area and proposed AfL Area that would result in the existing quality of the sediment being anything but at background levels.

However, on approach to Peterhead, there are a number of closed and open disposal sites (Figure 11-1). The export cable route corridor passes close to, but not within, the open North Buchan Ness and Peterhead disposal sites and the closed middle Buchan Ness and middle Buchan Ness B sites. The two open sites have been the location of the deposition of dredged harbour bed material from Peterhead and / or Boddam Harbour within the last 13 years (Walker *pers. comm*. Marine Scotland, 2013). It is worth noting that Marine Scotland advises that currently closed disposal sites can be re-opened (Walker pers. comm. Marine Scotland, 2013).

There are no designated Shellfish Growing Waters along the Aberdeenshire Coast (Marine Scotland, 2012).

Water quality

A section of sandy shoreline called the Peterhead Lido located in the outer part of Peterhead Harbour is a designated bathing water under the EU Bathing Water Directive (2006/7/EC), enacted in Scotland under the Bathing Waters (Scotland) Regulations 2008 (see Figure 11-1). Subsequently, during the summer season (1st June to 15th September) SEPA regularly monitors the water quality of this site. Since monitoring began at the site in 1991, it has failed the directives standards only once in 2002. The bathing water at this site attracts a diverse range of water sports users, including dingy sailors (SEPA, 2013).

11.3 Baseline environment – proposed surveys and data analysis

11.3.1 Surveys

As outlined in Section 7.3 SWL commissioned MMT to conduct an offshore benthic survey in August 2013. As part of the benthic survey, seabed grab sampling was conducted for sediment chemical analysis within the export cable route corridor. Chemical analysis of sediment samples will be conducted for hydrocarbons and heavy metals.

The survey scope for the offshore benthic survey, including the sediment chemical analysis was reviewed and approved by Marine Scotland prior to mobilisation of the survey (Xodus, 2013b).

11.3.2 Data analysis

The hydrocarbon analysis of the sediment grab samples collected within the export cable route corridor will include:

- Total hydrocarbon concentration (THC) and unresolved complex mixture (UCM) concentration (GC; detection limit 1 $\mu g.g^{-1}$); and
- Individual and total n-alkane concentrations including pristane and phytane concentrations (and assessment of indices such as the carbon preference index and the pristane:phytane ratio) (GC; detection limit 1 $ng.g^{-1}$).

Should hydrocarbon levels be detected that are considered to be above background levels, the following analyses will also be conducted:

- Individual and total 2-6 ring polycyclic aromatic hydrocarbon (PAH) concentrations and those of their respective alkyl derivatives (GC-MS; detection limit 1 $ng.g^{-1}$).

Trace and heavy metal (aluminium, arsenic, barium, chromium, copper, cadmium, mercury, lead, tin, nickel, vanadium and zinc) analysis will also be conducted.

Upon completion of the survey and data analysis an environmental survey report will be produced which, amongst other things, will detail the sediment analyses including the hydrocarbon analyses and heavy/trace metal analysis in order to inform a detailed description of the sediment chemical composition along the cable route corridor.

11.4 Data and information gaps

No data gaps are expected on the basis of a desk based review and the collection of sediment chemistry baseline information within the export cable route corridor as part of the benthic survey.

11.5 Identification of potential impacts

Potential impacts and the potential significance of those impacts on water and sediment quality are considered in Table 11-4 below.

Table 11-3 Potential significance of potential impacts on water and sediment quality

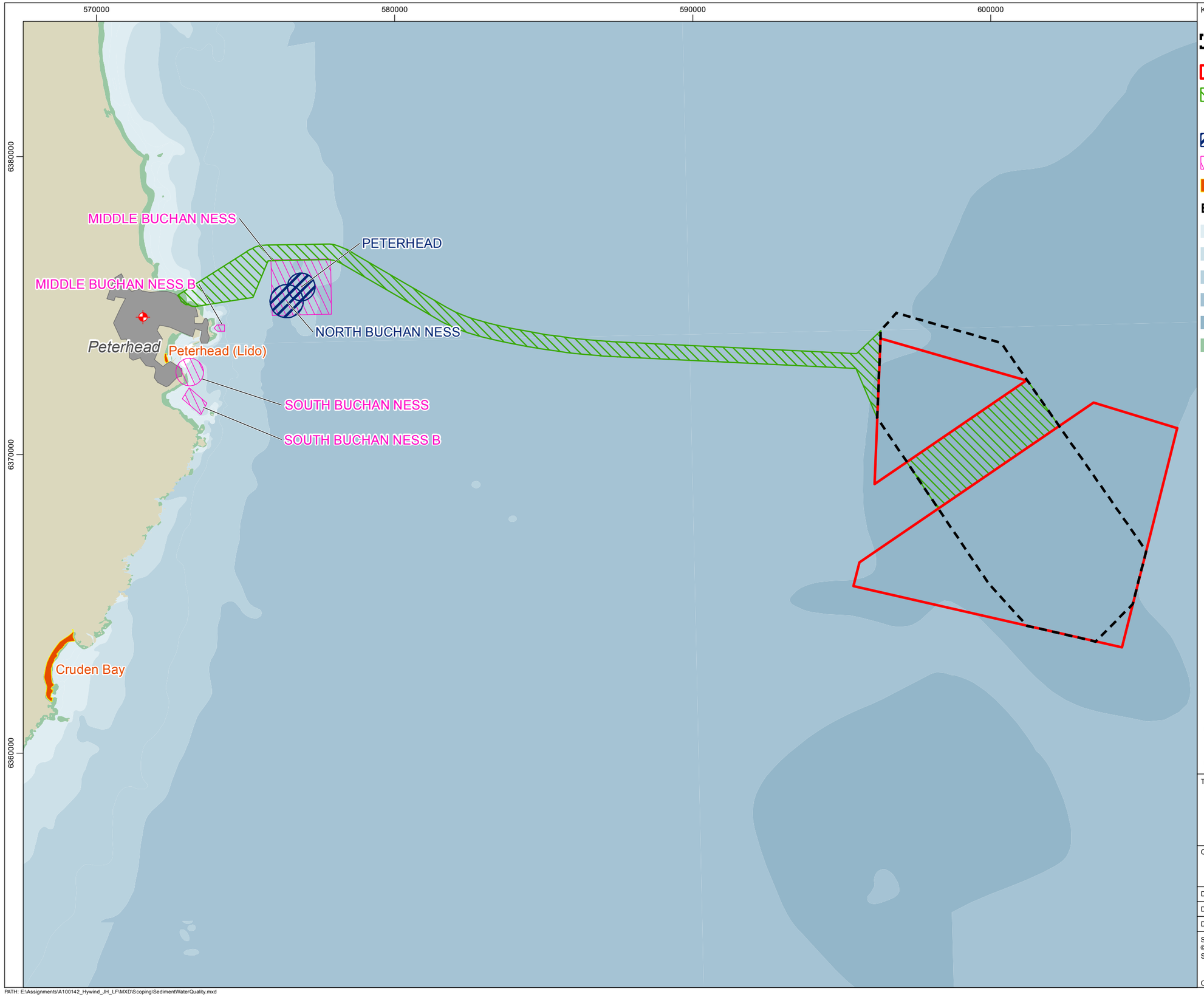
Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Pollution of sediment and water column from planned releases from WTG Units ballast	Low	No impact	Low	Any planned releases of ballast from the WTG Unit substructures during installation and decommissioning are unlikely to have significant effects on water and sediment quality due to the small number of WTG Units and the highly dispersive nature of the offshore environment.	No
Pollution of sediment and water column from unplanned leaks and spills (vessels / WTG Units)	Low	Low	Low	Due to the small scale of the Project, limited number of vessels involved during construction and O&M and fact that the WTG Units will be installed pre-assembled potential sources of pollution are limited and significant impacts on water and sediment quality are unlikely. Construction industry good practices and procedures will be followed and appropriate emergency procedures will be put in place.	No
Pollution of the water and sediment environment through the disturbance of existing contaminated sediments	Med	No impact	Med	There is potential for existing contaminated sediments to be disturbed during the installation and decommissioning of the export cable.	Yes
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

11.6 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown (Table 11-4).

Table 11-4 Impact assessment strategy for sediment and water quality

Potential impact	Assessment method	Relevant guidance
Pollution of the water and sediment environment through the disturbance of existing contaminated sediments	Sediment and water quality desk-based impact assessment, informed by chemical sediment analysis from benthic survey to determine the likely level of effect the Project will have on sediment and water quality.	No relevant guidance.



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation
- Open disposal site
- Closed disposal site
- Bathing Waters

Bathymetry (m)

- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200
- Intertidal

0 0.5 1 1.5 2 nm

0 1 2 3 4 km

N

TITLE:

Figure 11.1
Sediment and water quality features

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:125,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: SedimentWaterQuality.mxd			A01

SOURCE: Contains Ordnance Survey data
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Scottish Government, DEFRA

COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\SedimentWaterQuality.mxd

12 MARINE AIR QUALITY AND CLIMATE

12.1 Assessment strategy

12.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on marine air quality and climate will be based on the following:

Table 12-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment and Impact assessment	No potentially significant impacts have been identified. Marine air quality and climate has therefore been scoped out of the EIA and no impact assessment approach has been proposed. Justification for scoping out marine air quality and climate is provided below.	Not applicable as impacts scoped out

12.1.2 Justification for proposed assessment strategy

Renewable energy, in association with increased energy efficiency and energy reduction, is one of the primary means by which the Scottish Government seeks to meet its objectives on combating global climate change. Offshore wind is seen as a major contributor towards achieving targets relating to increased generation from renewable sources. Due to its size (30 MW maximum), the Hywind Scotland Pilot Park Project is unlikely to make a significant contribution in terms of renewables generation. However, as a major stepping stone towards the deployment of floating wind turbines on a large scale to exploit currently inaccessible offshore wind resources in deeper offshore waters the Project will contribute towards achieving climate change targets.

Locally, the climate around Peterhead is influenced by its proximity to the Atlantic depression, resulting in the east coast of Scotland being one of the windiest locations in the UK. Prevailing winds are generally from the west and south west with peak wind speeds reaching approximately 30 m/s.

There are no air quality management areas (AQMAs) to the north of Aberdeen, which includes the proposed Project. This reflects the relatively small level of industrialisation in the north and east of Scotland (DECC 2009).

Based on available data on local meteorological, air quality and climate conditions and understanding of the potential impacts of the Project in terms of offshore atmospheric emissions it has been concluded that there are unlikely to be any adverse effects on air quality and climate. Although vessels do emit gases such as carbon dioxide, sulphur oxides and nitrogen oxides, due to the scale of the Project (up to five WTG Units), the low number of vessels that will be involved in the construction and on-going operations and maintenance of the Pilot Park (see Section 2) and the location of the Pilot Park in an area of open water it is very unlikely that vessel emissions will have any effect on local, regional or national air quality or climate. **Therefore, it is proposed that impacts on air quality and climate are not included in the Hywind Scotland Pilot Park EIA.**

13 COMMERCIAL FISHERIES

13.1 Assessment strategy

13.1.1 Proposed strategy for assessment of potential effects

The proposed strategy for assessing the potential effects of the Project on commercial fisheries will be based on the following:

Table 13-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 13.2.2
	Review of data on fishing vessels collected as part of the PHA and subsequently the NRA	Section 13.2.2
	Consultation with Marine Scotland, fisheries associations, individual fishermen and representatives, fish producers, salmon fisheries boards and trusts etc	Section 13.3
Impact assessment	Assessments of impacts based on information from desk studies and on-going consultation	Section 13.6

13.2 Baseline environment – desk based study

13.2.1 Sources of baseline data

The following sources of baseline data and information will be used to inform the desk study for the commercial fisheries assessment.

Table 13-2 Baseline data sources (excluding surveys)

Type / description of data	Source(s)	Status
2012 landings / effort Data (vessels >10 m)	Marine Scotland fisheries statistics and data from International Council for Exploration of the Seas (ICES)	Collected – see high level baseline description below
2012 landings / effort data (vessels <10 m)		
Landings / effort data for five year period 2007 to 2012/13	Marine Scotland fisheries statistics data from International Council for Exploration of the Seas (ICES)	To be collected as part of the EIA
Salmon and sea trout catch statistics	Marine Scotland Science (MSS)	
ScotMap	Marine Scotland (http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/ScotMap)	

Type / description of data	Source(s)	Status
Fishing vessel sightings (2008 – 2012)	Marine Scotland Compliance	Collected – see high level baseline description below and PHA included in Appendix C
Satellite based fishing vessel positioning -Vessel Monitoring System (VMS) Data (2011 – 2012)	Marine Management Organisation (MMO)	Collected – see high level baseline description below and PHA included in Appendix C
Consultation	Consultation with Marine Scotland, fisheries associations, individual fishermen and representatives, fish producers, salmon fisheries boards and trusts etc	On-going - to be collected as part of the EIA

13.2.2 Desk-based review of existing information

An overview of landings / effort data for 2012 collected for commercial fisheries in the Peterhead and Buchan Deep area is provided below. As part of this EIA these data will be supplemented with five to six years of annual fisheries data on landings and effort collected by Marine Scotland, data from ScotMap and data and information relating to salmon and sea trout fisheries.

Data on fishing effort, quantity and value of landing is presented for rectangular geographical areas defined by the International Council for the Exploration of the Sea (ICES). These geographical areas (ICES rectangles) cover the entire globe. As part of the characterisation of commercial fishing activities in the Exclusivity Area, proposed AfL Area and export cable route corridor and surrounding areas, relevant data on fishing effort, quantity and value of landings has been reviewed for the ICES rectangles within which the offshore components of the Hywind Scotland Pilot Park Project are located.

Fishing effort, quantity and value of landings in ICES rectangles 43E8, 44E8 and 44E9

The Hywind Scotland Exclusivity Area and proposed AfL Area are located mainly within ICES rectangle 43E8 although the northwest tip of the proposed AfL Area closely borders ICES rectangle 44E8. The export cable route corridor passes mainly through rectangle 44E8, although sections closet to the Exclusivity Area and proposed AfL Area are within 43E8.

Scottish sea fisheries statistics for 2012 (provisional data from Marine Scotland) show that both rectangles 43E8 and 44E8 are targeted for mainly for demersal, pelagic and shellfish species by vessels both over and under 10 m in length. Vessels less than 10 m in length comprise less than 15% of total landings in terms of both value and weight in rectangle 43E8 and 22% and 16% of the value and weight of landings respectively in rectangle 44E8.

Over forty different species of fish were landed from ICES rectangle 43E8 and 44E8 in 2012 by vessels over 10 m. The most landed species (> 20 tonnes) include herring *Clupea harengus*, scallops *Pecten maximus*, haddock *Melanogrammus aeglefinus*, brown crab *Cancer pagurus*, Norway lobster *Nephrops norvegicus*, mackerel *Scomber scombrus*, velvet crab *Necora puber*, cod *Gadus morhua*, lobsters *Homarus gammarus* whiting *Merlangius merlangus*.

In 2012, boat dredgers carried on vessels over 10 m was the most frequently used type of fishing gear in ICES rectangle 43E8, accounting for 63% fishing effort. In comparison, bottom otter trawls and otter twin trawls in the same area were used for 14% and 13% of the time respectively. In ICES rectangle 44E8 bottom otter trawls are the most utilised gear comprising 41% of fishing effort in 2012. This is followed by boat dredges which are utilised 25% of the time (Scottish Government, 2013a).

A study on the activity and spatial distribution of fishing vessels less than 15 m in length has recently been carried out by Marine Scotland. This shows that five vessels use the area in the vicinity of the proposed development site and it is worth £221 per surrounding cell. This increases to 35 to 94 vessels in some cells along the coast including

the section within the landfall area of search and at the landward end of the export cable corridor (Scottish Government, 2013b). Most vessels in this area use static gear to target shellfish species (crab and lobster).

Fishing vessel data from the Preliminary Hazard Assessment (PHA)

Vessel sightings data obtained from Marine Scotland Compliance, who monitors fishing activities in Scottish waters using patrol vessels and surveillance aircraft, has been analysed by Anatec as part of the PHA. The analysis identified that there were two recorded sightings of UK registered fishing vessels within the Exclusivity Area between 2008 and 2012, both of which were 15 - 24 m in length. One of the vessels was a demersal trawler; the other was a pair trawler (Anatec, 2013). Of the two vessels recorded, one was identified as being engaged in fishing activity (gear deployed) the other was steaming (in transit to/from fishing grounds) (Anatec, 2013).

A review of vessel satellite tracking (VMS data) for 2011 and 2012 also carried out as part of the PHA found that 94% of the vessels present within ICES rectangle subsquares 44E8/3 and 44E8/4, and 43E8/1 and 43E8/2 were UK registered. Of the vessels recorded in the Exclusivity Area, 53% were moving at speeds of above 5 knots and therefore were likely to be steaming through the area. The remaining 47 % of tracks were at speeds of less than 5 knots, indicating that they could be engaged in fishing activities.

13.3 Baseline environment – consultations and further data analysis

13.3.1 Consultation

In terms of commercial fisheries, consultation to date has been undertaken both as part of pre-scoping consultation and as part a series of discussions with local Peterhead fishermen in preparation for the geophysical survey which was carried out in August and September 2013. Responses received during these consultations are summarised below.

Pre-scoping consultation meeting with SFF

As part of pre-scoping consultation a couple of meetings were held with SFF. The focus of these meetings was to discuss the Project and undertake initial identification of any potential issues / impacts on offshore commercial fisheries. At both meetings SFF identified that the Buchan Deep was an important area for haddock and herring and raised concern over the possibility that the Project would result in the closure of the Buchan Deep to vessels with moveable fishing gear e.g. trawlers.

As part of these discussions, SFF provided maps showing fishing vessel tracks based on GPS readings collected over a number of years for the offshore fishing areas in Scottish Waters. These maps, which illustrate tracks for one fishing vessel (John Watt, *per comms*, July 2013), indicate that trawling through the Buchan Deep generally follows a northeast southwest alignment running parallel to the BP Forties to Cruden Bay pipelines. For confidentiality reasons these maps have not been reproduced for inclusion in this Scoping Report.

In August / September 2013, Xodus and Anatec requested further advice from SFF with respect to verifying the findings from Anatec's analysis of vessel sightings data and VMS data as discussed above. As part of these data validation, SFF confirmed that the VMS data is accurate in terms of activity and timings and that the Buchan Deep is not fished intensely (John Watt email, August 2013). However, it was also noted that, as identified during earlier meetings, the Buchan Deep is important for haddock and herring and that fishing for herring would normally occur during the months of July and August which would coincide with higher activity recorded in the area from the VMS during these months. Pelagic vessels travelling at less than 5 knots could be searching for shoals of herring as well as fishing the shoals (John Watt, email, September 2013).

SFF also highlighted that the Buchan Deep is an important winter fishing ground for haddock. Haddock is one of the species that Scottish fishermen have in abundance therefore this species is targeted towards the end of the year by fishermen who have reached their Total Allowable Catch (TAC) for other fish species. Targeting haddock at this time of year also helps to prevent other species (cod and whiting) being closed off too early (John Watt, email, September 2013).

Due to its location relatively close to shore, the Buchan Deep can be fished in one day and therefore provides an important fishing ground to local fishermen in winter when weather conditions prevent fishing further offshore. Consequently, due to the high demand for haddock in winter, fishermen can get maximum returns for their catches with minimal time spent at sea (John Watt, email, September 2013). This is especially important when allocated fishing days and quotas are running low.

Further discussions will be held with SFF to discuss the potential impacts on commercial fishing activities within the Buchan Deep and identify possible mitigation measures as part of the Project.

Pre-scoping consultation with Peterhead Port Authority

A pre-scoping meeting was also held with Peterhead Port Authority on 11th July 2013. During this meeting it was noted that Peterhead Port is the largest port in Europe for whitefish with £150 m value of landings per year and that Fraserburgh Port is largest port in Europe for prawns with £30 m value of landings per year.

Pre-scoping consultation with Marine Scotland Compliance

It was identified during the pre-scoping meeting held with Marine Scotland, Aberdeenshire Council, SNH and JNCC in June 2013 that the River Ugie which is located to the north of the landfall area of search is an important salmon fisheries river. The river itself is not designated as an SAC for Atlantic salmon (see Section 8.2.2), although the river estuary and surrounding waters are important for salmon net fisheries. It is understood that a large proportion of the salmon net fishing activity in this area is undertaken by the Ugie Smokehouse which is located on the banks of the estuary. The area is also important for sea trout.

Pre-survey consultation with SFF, Buchan Inshore Fisheries Association (BIFA) and local Peterhead fishermen

Extensive consultation has been undertaken with the Scottish Fishermen's Federation (SFF) and local fishermen in the Peterhead area in relation to the geophysical survey which was carried out during August and September 2013 covering the Exclusivity Area, proposed AfL Area and proposed export cable route corridor. As part of these discussions information was provided on the key commercial fishing activities that occur within the Exclusivity Area, proposed AfL Area and proposed export cable route corridor. .

Overall, it is understood that the nearshore area extending seaward from the Mean High Water Spring (MHWS) out to 1°40'W is fished mainly by creel fishermen for crab (velvet and brown) and lobster and that no creeling takes place beyond 1°40'W (Gavin Thain (BIFA), *Per Comms*, 2013). Waters beyond 1°40'W towards the Buchan Deep are dredged for scallops with trawling for white fish and squid occurring further offshore. Scallop dredging tends to occur between March and June.

13.3.2 Further consultation

As the EIA progresses further consultation will be undertaken with fisheries organisations and individual fishermen as part of both the characterisation of commercial fisheries in the area and the assessment of impacts on commercial fisheries. Information obtained and discussions as part of on-going consultation will be presented in the ES and NRA as appropriate.

13.4 Data and information gaps

Any data or information gaps emerging during baseline characterisation will be addressed as part of on-going consultation with fisheries organisations and fishermen.

13.5 Identification of potential impacts

Possible impacts and the potential significance of those impacts on commercial fisheries are considered in Table 13-3 below.

Table 13-3 Possible impacts and the potential significance of those impacts on commercial fisheries

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Loss of access to fishing grounds	Med	High	Low	There is potential that the presence of the WTG Units in the Buchan Deep will limit access to this area for fishermen using moveable fishing gear e.g. trawlers. The significance of these impacts will need to be assessed in more detail as part of the EIA and NRA.	Yes
Navigation and collision risk	Med	Med	Med	There is potential increased risk of collision with vessels and WTG Units during installation and decommissioning. Once operational the presence of the Pilot Park and O&M vessels could present an increased navigational risk to fishing vessels that transit through the Buchan Deep on route to fishing grounds further offshore. These impacts will be assessed in detail as part of the NRA (see Section 14).	Yes
Fishing gear and anchor interaction	Med	Med	Low	There is a potential risk that towed fishing gear could get snagged on WTG Units (base of the substructure present in water column), mooring lines and anchors. This could lead to the damage and/or loss of fishing gear. The safety risk of snagging fishing gear will be covered in the NRA (see Section 14).	Yes
Electromagnetic fields (EMF)	Low	Med	No impact	Installation activities, WTG Unit presence and presence of subsea cables (due to potential electromagnetic field (EMF)) may alter the behaviour, distribution and abundance of certain commercial fish species.	Yes
Change in abundance of targeted species	No impact	Positive	No impact	Once operational the Pilot Park could provide an area of shelter for certain fish species which may have a positive effect on species abundance and commercial fish stocks.	Yes
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

13.6 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown (Table 13-4).

Table 13-4 Impact assessment strategy for commercial fisheries

Potential impact	Assessment method	Relevant guidance
Loss of access to fishing grounds Navigation and collision risk Fishing gear and anchor interaction Electromagnetic fields (EMF) Change in abundance of targeted species	Assessment will of all potential impacts on commercial fisheries will be based on the desk based study and consultation with fisheries organisations and local fishermen in order to determine how the Project will impact local fishing activities, the significance of these impacts and options for mitigating any significant impacts. Impacts on fishing vessel in terms of navigational risk will be assessed in detail as part of the NRA.	Guidance on licencing and environmental impact assessment (EIA) requirements for offshore wind farms (Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2004). Guidelines for data acquisition to support marine environmental assessments for offshore renewable energy projects (Adrian Judd, Cefas, 2012). Marine Scotland Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Volume 1: Environmental Report (Marine Scotland, 2010). United Kingdom Offshore Operators Association (UKOOA), Guidelines to improve relations between Oil & Gas industries and near-shore fishermen (UKOOA, 2006). UK Oil & Gas, Fisheries Liaison Guidelines (UK Oil and Gas, 2008). Guidance on commercial fisheries mitigation and opportunities by Collaborative Offshore Wind Research into the Environment (COWRIE, 2010). Guidance relating to the NRA is discussed in Section 14.

14 SHIPPING AND NAVIGATION

14.1 Assessment strategy

The proposed strategy for assessing the potential effects of the Project on shipping and navigation will be based on the following:

Table 14-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 14.2
	Requirements for the collection of additional data on vessel movements through the area are the subject of on-going discussions with the Maritime and Coastguard Agency (MCA)	Section 14.3
Impact assessment	Navigational Risk Assessment (NRA)	Section 14.6

14.2 Baseline environment – desk based study

A preliminary hazard analysis (PHA) has been undertaken by Anatec (Appendix C). This includes a desk study of the shipping and navigational activities in the Hywind Scotland Exclusivity Area. A summary of this desk study is provided below. It should be noted that although the PHA refers to the Exclusivity Area rather than the proposed AfL Area this this does not significantly affect the findings of the AIS analysis in terms of number of intersections etc., as summarised below.

14.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects on shipping and navigation, baseline data and information will be collected from the following sources:

Table 14-2 Baseline data sources

Type / description of data	Source	Status
Automatic Identification System (AIS) data	Anatec (2013 – Appendix C)	Collected – see high level baseline description below and Appendix C
Fishing vessel sightings (2008 – 2012)	Marine Scotland Compliance	Collected – see high level baseline description below and Appendix C
Satellite based fishing vessels positioning (2011 – 2012)	Marine Management Organisation (MMO)	Collected – see high level baseline description below and Appendix C
Recreational vessel activity	RYA – Sharing the wind 2004 and UK Coastal Atlas of Recreational Boating; Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast; Second Edition	Collected – see high level baseline description below and Appendix C
Historical maritime incidents	Records from Marine Accident Investigation Branch (MAIB) and Royal National Lifeboat Institution (RNLI)	Collected – see high level baseline description below and Appendix C

14.2.2 Desk-based review of existing information

The PHA (Appendix C) includes a summary of Automatic Identification System (AIS) data from within 10 nm of the Exclusivity Area for a 28 day period in 2012/2013 (14 days in August 2012 and 14 days in January 2013). The vessels recorded included a mixture of fishing, tug, passenger vessels, cargo ships, tankers and 'other ships', with cargo and 'other ships' accounting for 35% and 37% of tracks respectively. An average of 48 unique vessels per day were tracked within 10 nm of the Exclusivity Area, with an average of eight ships per day passing through the Exclusivity Area. The busiest day was in August 2012 when 13 ships were recorded intersecting the Exclusivity Area.

The most common destinations were the north east Scotland ports of Aberdeen and Peterhead, fishing grounds and oil and gas fields in the North Sea such as Balmoral. In comparison to the high levels of shipping traffic towards the west of the Exclusivity Area associated with the traffic headed to and from busy ports such as Aberdeen and Peterhead and traffic passing up and down the east coast of the UK, shipping traffic levels within the Exclusivity Area are moderate.

Vessel sightings data obtained from Marine Scotland Compliance, who monitors fishing activities in Scottish waters using patrol vessels and surveillance aircraft, recorded two sightings of fishing vessels within the Exclusivity Area between 2008 and 2012, both of which were 15 -24 m in length. Vessel satellite tracking (VMS data) for 2011 and 2012 found that 94% of the vessels present within ICES rectangle subsquares 44E8/3 and 44E8/4, and 43E8/1 and 43E8/2 were UK registered. Of the vessels recorded in the Exclusivity Area, 53% were moving at speeds of above 5 knots and therefore were likely to be steaming through the area. The remaining 47 % of tracks were at speeds of less than 5 knots, indicating that they could be engaged in fishing activities.

Based on the RYA published data, the Exclusivity Area is well outside any general racing and sailing areas. There are also no cruising routes crossing the Exclusivity Area. The nearest sailing club is a Peterhead, at which there is also the closest marina to the Exclusivity Area.

A total of 17 incidents were reported to MAIB and 16 to the RNLI in the area within 10 nm of the Exclusivity Area within the last ten years. Within the last ten years there have been no reported incidents to the MAIB within the Exclusivity Area and only one to the RNLI. This incident involved a large fishing vessel which suffered a machinery failure on 22 June 2001.

14.3 Baseline environment – proposed surveys and data analysis

14.3.1 Surveys

The approach to carrying out the NRA in accordance with requirements of Marine Guidance Notice (MGN 371) including requirements for the collection of additional data on vessel movements through the area is the subject of on-going discussions with the MCA. A detailed description of the agreed approach to the NRA will be included in the NRA Report.

14.3.2 Data analysis

Requirements for additional data analysis will depend on the outcome of discussions with the MCA regarding the collection of additional data on vessel movements through the Exclusivity Area.

14.4 Data and information gaps

Potential data and information gaps will be identified and addressed through the on-going discussions with the MCA.

14.5 Identification of potential impacts

Possible impacts along with the potential significance of effects on shipping and navigation are considered in Table 14-3 below.

Table 14-3 Possible impacts along with the potential significance of effects on shipping and navigation

Potential impact	Phase			Comment / justification	Scoped into EIA (addressed in NRA)?
	C/I	O/M	D		
Collision risk with installation and O&M vessels and WTG Units	Med	Med	Med	Installation and O&M vessel(s) and WTG Units could pose a surface collision risk and an obstruction to navigation for all vessels.	Yes
Rotor blade and sailing yachts mast interaction	No impact	Med	No impact	There is potential for rotor blades to interact with the masts of sailing yachts depending upon the air clearance of the WTG Units.	Yes
Vessel traffic re-routing due to presence of installation vessels / WTG Units and associated safety zones	Med	Med	Med	There is the potential for installation vessels and their associated safety zones to restrict the sea room available to vessels transiting to or from the east coast of Scotland.	Yes
Fishing gear and anchor interaction	Med	Med	Low	There is a risk of fishing gear and anchors to interaction with WTG Unit mooring system and / or cables.	Yes
Interaction between WTG Units and marine electronics equipment	No impact	Med	No impact	There is potential for the operation of the WTG Units to effect marine electronics equipment e.g. ship and port radar.	Yes
Loss of station	Med	Med	Med	If part of the w WTG Unit loses station it could pose a risk to other vessels navigation in the area.	Yes
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

14.6 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown (Table 14-4).

Table 14-4 Impact assessment strategy for shipping and navigation

Potential impact	Assessment method	Relevant guidance
All impacts on shipping and navigation	Full Navigational Risk Assessment (NRA) – see PHA Report (Appendix C)	Department for Energy and Climate Change (DECC) Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (2005). Maritime and Coastguard Agency (MCA) Marine Guidance Notice 371 (MGN 371) Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues.

15 MARINE ARCHAEOLOGY AND CULTURAL HERITAGE

15.1 Assessment strategy

The proposed strategy for assessing the potential effects of the Project on marine archaeology and cultural heritage will be based on the following:

Table 15-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 15.2
	Analysis of geophysical survey data	Section 15.3
Impact assessment	Assessments of impacts based on data and information from desk studies and analysis of geophysical survey data	Section 15.6

The proposed approach and method for carrying out the marine archaeological and cultural heritage assessment, based on the strategy outline in Table 15-1 is described in detail in the Hywind Scotland Pilot Park: Historic Environmental Assessment Method Statement, prepared by the Orkney Research Centre for Archaeology (ORCA, ORCA, 2013). This document, which also includes detail on the approach and method for the onshore archaeological and cultural heritage assessment, which has also been submitted to Marine Scotland and Aberdeenshire Council for approval.

15.2 Baseline environment – desk based study

15.2.1 Sources of baseline data

As outlined in the Method Statement (ORCA, 2013) the desk based study for the assessment of effects on marine archaeology and cultural heritage, baseline data and information will be collected from the following sources:

Table 15-2 Baseline data sources

Type / description of data	Source	Status
Features of marine archaeology and cultural heritage importance	The National Monuments Record of Scotland, either directly or by using the Canmore and Pastmap database websites The Archaeology Data Service: ARCHway and HEIRNET Register databases Statutory lists, registers and designated areas, including Designated Wrecks and HMPAs British Geological Survey maps and survey data Relevant nautical charts including those from the Admiralty, UK Hydrographic Office, as well as historic maps and charts of the study area The Receiver of Wreck, Ministry of Defence and the UKHO Marine Coastguard Agency wreck databases	To be collected as part of EIA Figure 15-1 displays charted wrecks

Type / description of data	Source	Status
	Other online wreck databases (such as the Nautical Archaeology and UK-diving) Whittaker IG 1998 Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters, Edinburgh Larn, R & Larn, B 1998 The Ship Wreck Index of Great Britain & Ireland Vol.4 Scotland Strategic Environmental Assessments of the relevant maritime area or for particular industries commissioned by the Dept of Trade and Industry (DTI), the Dept of Energy & Climate Change (DECC) and the Scottish Government Appropriate archaeological, historical and nautical journals, monographs and books, including the Old and New Statistical Accounts of Scotland Historical documents held in national and local archives, such as libraries, museums and record offices Relevant unpublished material by professional and amateur archaeologists and historians Ordtek Unexploded Ordnance Desk Based Study with Risk Assessment (2013)	

15.2.2 Desk-based review of existing information

A detailed review of available baseline data will be carried out as part of the environmental assessment. Data on chartered wrecks in the Exclusivity Area, proposed AfL Area and along the export cable route corridor as identified on admiralty charts is illustrated in Figure 15-1. These chartered wrecks were taken into account during identification of the export cable route corridor. Additional baseline data will be provided following the desk based study and the analysis of data collected during the geophysical survey as discussed below. This will also include a review of the Unexploded Ordnance Desk Based Study and Risk Assessment carried out by Ordtek in July 2013.

15.3 Baseline environment – commissioned surveys and data analysis

As outlined in Section 7.3 SWL commissioned a geophysical and benthic environmental survey of the Exclusivity Area, proposed AfL Area and export cable route corridor which was conducted in August and September 2013. The geophysical data collected (multi-beam echo sounder (MBES), side-scan sonar (SSS), sub-bottom profiler (SBP) and magnetometry) alongside environmental data (video, photographs and grabs, where required) will be carefully inspected by an experienced marine archaeologist to identify anomalies of potential for archaeological or anthropogenic origin, palaeoenvironmental potential or cultural remains.

15.4 Data and information gaps

Depending on the anomalies identified during the analysis of the geophysical data it may be necessary to carry out more detailed targeted surveys in the development area or along the export cable route. It is proposed that where more detailed surveys are identified as being required during the EIA these would be undertaken post consent as part of the Project mitigation strategy and management of risk.

15.5 Identification of potential impacts

Possible impacts and the potential significance of those impacts on marine archaeology and cultural heritage are considered in Table 15-3 below.

Table 15-3 Possible impacts and the potential significance of those impacts on marine archaeology and cultural heritage

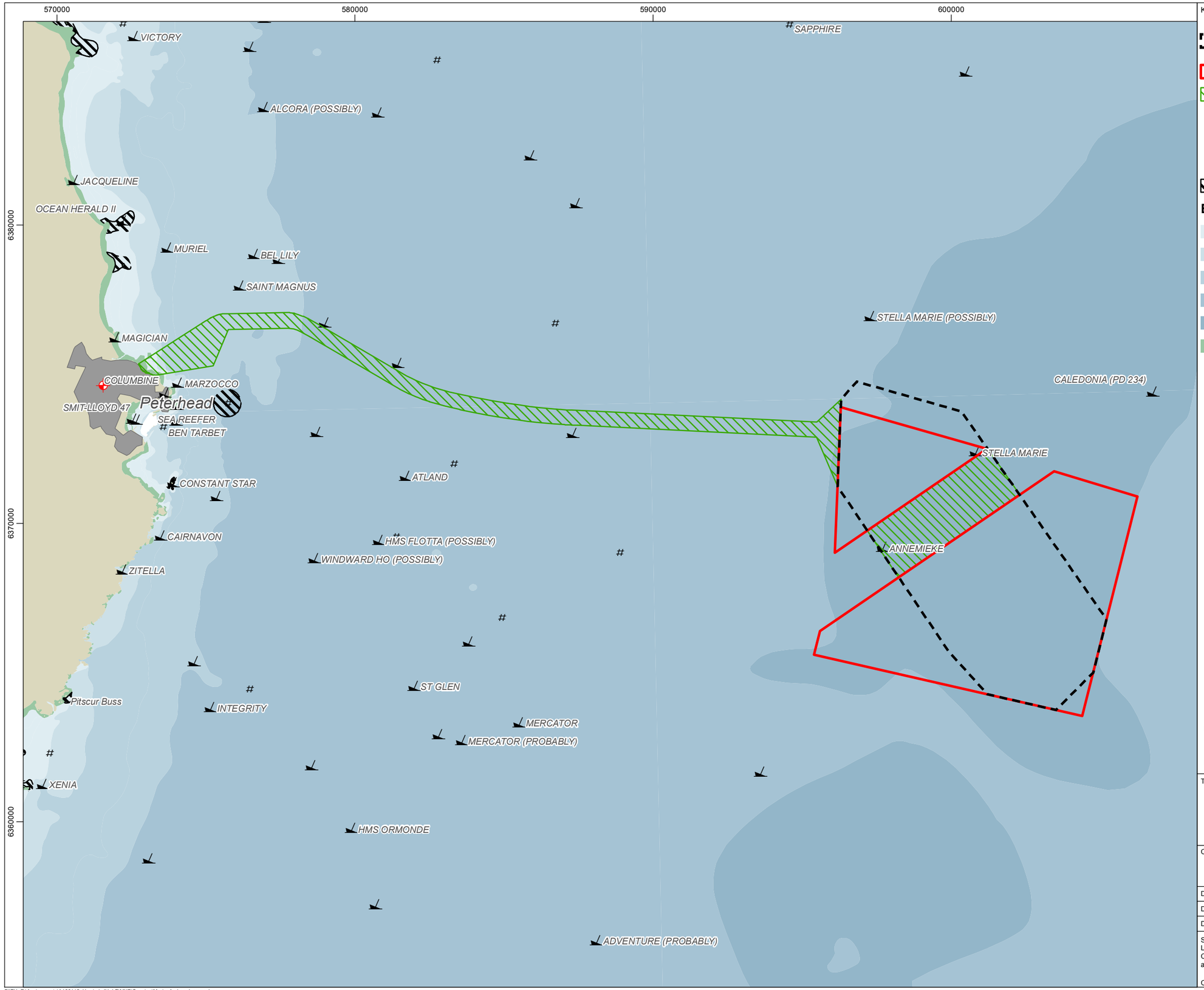
Potential impact	Phase			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Potential direct disturbance to or loss of known and unknown assets and features of cultural and historical importance in the marine environment	Med	No impact	Med	Potential for known and unknown assets and features to be directly disturbed or destroyed during the installation and removal of anchors and mooring chains / cables and during the burial of the export cable due to disturbance of seabed.	Yes
Potential indirect loss of known and unknown assets and features of cultural and historical significance in the marine environment	Low	No impact	Low	As identified in Section 10 the potential for impacts on coastal processes and sediment dynamics is likely to be low except for in the direct vicinity of the anchors.	No
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

15.6 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified (Table 15-4).

Table 15-4 Impact assessment strategy for marine archaeology and cultural heritage

Potential impact	Assessment method	Relevant guidance
Direct disturbance to, or loss of, assets of known and unknown cultural and historical significance	Assessment of known and unknown cultural and historical assets in accordance to relevant standards and guidance	Historic Scotland March 2012 The Marine Historic Environment: Strategy for the Protection, Management and Promotion of Marine Heritage 2012-15. The Joint Nautical Archaeology Policy Committee and The Crown Estate's Maritime Cultural Heritage & Seabed development: JNAPC Code of Practice (2006). COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (2007), by Wessex Archaeology Ltd. COWRIE Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (2008) by Oxford Archaeology & George Lambrick Archaeology and Heritage. Gribble, J & Leather, S for EMU Ltd Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (GEOARCH-9) commissioned by COWRIE Ltd.



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation
- # Obstruction
- Wreck
- Foul ground

Bathymetry (m)

- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200
- Intertidal

0 0.5 1 1.5 2 nm

0 1 2 3 4 km

N

TITLE:

Figure 15.1
Marine archaeology

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:125,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: MarineArchaeology.mxd			A01

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16 MILITARY, AVIATION AND RADAR, AND UNEXPLODED ORDNANCE

16.1 Assessment strategy

The proposed strategy for assessing the potential effects of the Project on military, aviation and radar and unexploded ordnance (UXO) will be based on the following:

Table 16-1 Summary of assessment strategy

EIA process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 16.2
	Geophysical survey	Section 16.3
	Consultation	Section 16.3
Impact assessment	Assessments of impacts based on data and information from desk studies, surveys, radar modelling and through consultation.	Section 16.6

16.2 Baseline environment – desk based study

16.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects on military, aviation and radar and UXO, baseline data and information will be collected from the following sources:

Table 16-2 Baseline data sources

Type / description of data	Source	Status
Military sites and activities	UK Hydrographic Office (UKHO)	Collected - see high level baseline description below
	Consultation with MoD	Planned as part of EIA and NRA
Aviation and radar	PagerPower (2011, 2013).	Collected (PagerPower 2011; 2013) - see high level baseline description below
Potential for unexploded ordnance	UK Hydrographic Office (UKHO) The National Archives, London Royal Navy Historical Archive, Portsmouth British Ministry of Defence, Air Historical Branch, RAF, Northolt Pertinent authoritative British and German publications Web based archives Ordtek internal database	Collected (Ordtek, 2013a) - see high level baseline description below

Type / description of data	Source	Status
	Federal Maritime and Hydrographic Agency (BSH) in Hamburg Naval Office of the German Federal Armed Forces, Division Geo 1, Underwater Data Centre Rostock	
	Site specific geophysical survey	Survey conducted August and September 2013

16.2.2 Desk-based review of existing information

Military

The Project is not located within or close to any ministry of defence (MoD) practice or exercise areas. The nearest sites to the Project are a small firing danger area off the coast of Aberdeenshire to the south of the Project and the Moray Firth practice and exercise areas to the north (see Figure 17-1 in Section 17: Other sea users).

Aviation and radar

PagerPower have undertaken an assessment of the potential effects on aviation and radar, in relation to the Project (PagerPower, 2011; 2013). The findings are summarised below.

Radar

There are three Primary Surveillance Radar (PSR) identified installations that have the potential to be affected by the Project (PagerPower, 2011; 2013):

- RAF Buchan ASACS (UK Air Surveillance and Control System (UK) - Air Defence Radar – T92 Lockheed Martin);
- NATS Allanshill PSR (NATS En Route Air Traffic Control Radar); and
- NATS Perwinnes PSR (NATS En Route Air Traffic Control Radar).

Pager Power (2011, 2013) identified that the proposed five WTG Units located within the Exclusivity Area and proposed AfL Area are likely to be within radar line of sight to RAF Buchan and NATS Perwinnes. However, all five WTG Units are unlikely to be within radar Line of sight to NATS Allanshill PSR.

Following analysis conducted by PagerPower (2011; 2013) it is unlikely that there will be any effects on Secondary Surveillance Radar (SSR) at NATS Allanshill and Perwinnes or other aviation installations.

Aviation

PagerPower (2011) identified that the Exclusivity Area and proposed AfL Area are likely to be very busy in terms of air traffic, much of which is likely to comprise of helicopter operations.

PagerPower (2011; 2013) identified eight helicopter main routes (HMR068, HMR071, HMR074, HMR077, HMR080, HMR083 HMR083 and HMR089) within close proximity of the Exclusivity Area and proposed AfL Area. Helicopters along main routes normally fly at altitudes which will be unaffected by the presence of WTG Units. However in some weather conditions they may wish to fly at less than 1,500 feet. Obstacle clearance from the WTG Units would then become an issue. Obstacle clearance may also be an issue for helicopters performing emergency rescue operations at sea.

Unexploded ordnance (UXO)

Ordtek (2013a) conducted a desk based study and risk assessment to assess the potential risk to the Project from UXOs. A summary is provided below.

Ordtek (2013a) identified that the presence of dump sites, official and unofficial, and the explosive ordnance legacy from two World Wars and modern military exercises have the potential to contaminate the Exclusivity Area, proposed AfL Area and export cable route corridor with UXOs. The UXO threat items most likely to be encountered are German WWI and British WWII moored mines that have sunk to the seabed. Possible charge weights vary from 50 kg to 350 kg but are most likely to be between 90 kg and 227 kg. The typical diameter of the buoyant mines likely to be present is 0.84 to 1.01 m.

The desk based study and risk assessment conducted by Ordtek (2013a) identified that the risk from UXO to the Project ranges from low to moderate and that mitigation would be required to reduce the risk to low as reasonably practicable (ALARP).

16.3 Baseline environment – proposed surveys and data analysis

16.3.1 Geophysical survey

As noted in Section 7, SWL has recently conducted a geophysical and benthic environmental survey of the Exclusivity Area, proposed AfL Area and the export cable route corridor. The geophysical survey will help to identify large items of UXO (i.e. greater than 1 m in length) using the high resolution side scan sonar (SSS) and multibeam echo sounder (MBES). The analysis of these survey outputs as part of the EIA will identify the potential for the presence of UXO objects within the proposed AfL Area and export cable route corridor and identify further survey or desk study requirements.

16.3.2 Consultation

Consultation will be conducted as part of the EIA with a number of stakeholders with particular interest in military and aviation and radar items as recommended by PagerPower (2011; 2013). These stakeholders will include NATS/NERL, helicopter operators and the MoD.

16.4 Data and information gaps

Data from the geophysical survey will be used to inform the UXO assessment. It may also be necessary to carry out more detailed targeted surveys to assess the potential UXO risk. It is proposed that these are undertaken post consent as part of the Project mitigation strategy and management of risk.

16.5 Identification of potential impacts

Possible impacts and the potential significance of those impacts on military, aviation and radar and UXO are considered in Table 16-3 below.

Table 16-3 Possible impacts and the potential significance of those impacts on military, aviation and radar and UXO

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Interference with military practice and exercise areas	No impact	No impact	No impact	Given that the Pilot Park will not be located within, or near to any Ministry of Defence (MOD) practice or exercise areas the Project is unlikely to have any impacts on these activities.	No
Interference with aviation e.g. helicopter routes	No impact	Med	No impact	There is potential for the WTG Units to interfere with aviation activities. The potential for interference will be further refined in consultation (Section 16.3.2).	Yes
Interference with radar	No impact	Med	No impact	There is potential for the WTG Units to be detected and interfere with radar. The potential for interference will be further refined during consultation (Section 16.3.2).	Yes
Inadvertent detonation with consequent damage to equipment or injury to personnel from interaction with UXO	Unknown	Unknown	Unknown	There is potential for UXO to be present within the Pilot Park and along the export cable route corridor, which if un-detected, could be inadvertently detonated.	Yes
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

16.6 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown.

Table 16-4 Impact assessment strategy for military, aviation and radar and UXO

Potential impact	Assessment method	Relevant guidance
Interference with aviation e.g. helicopter routes	Consultation with NATS/NERL and helicopter operators. Where required refined air/traffic airspace assessment for proposed WTG Unit deployment locations to analyse traffic flows and airspace structure to determine the potential operational impact. The scope of the assessment method will be refined following consultation.	No specific relevant guidance identified.

Potential impact	Assessment method	Relevant guidance
Interference with radar	Consultation with NATS/NERL. Where required refined radar modelling of the proposed WTG Unit deployment locations will be conducted to determine the extent of radar visibility and potential impacts on radar performance. The scope of the assessment methods required will be refined following consultation.	No specific relevant guidance identified.
Inadvertent detonation with consequent damage to equipment or injury to personnel from interaction with UXO	The receptor for UXO is different to most covered in this Scoping Report as the issues are related to the impact the UXO may have on the proposed Project rather than the changes due to the Project impacting the receptor. Consequently potential impacts from UXO are identified through a risk assessment rather than a traditional impact assessment. The assessment method will include an update to the Ordtek (2013) risk assessment, including the geophysical survey data, to determine the likelihood of the presence of UXOs within the proposed AfL Area and export cable route corridor and defined any further work requirements to manage / mitigate identified risks to ALARP.	No specific legislation exists for the management and control of UXO risk in the UK construction industry. However, the issues regarding health and safety that arise from any ordnance risk associated with construction work is addressed under several regulatory instruments, such as the Health and Safety at Work etc. Act 1974 and the Construction (Design and Management) Regulations 2007. Other relevant legislation includes the Management of Health and Safety at Work Regulations 1999. These legal instruments require risk assessments to derive control measures that are consistent with the as low as reasonably practicable (ALARP) principle and ensure that method statements and other provisions reflect these decisions.

17 OTHER SEA USERS

17.1 Assessment strategy

The proposed strategy for assessing the potential effects of the Project on other sea users will be based on the following:

Table 17-1 Summary of assessment strategy

EIA Process	Overview of approach	Relevant section
Baseline environment	Desk based study.	Section 17.2
Impact Assessment	Assessments of impacts based on desk studies and consultations with relevant stakeholders as necessary	Section 17.6

17.2 Baseline environment – desk based study

17.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects on other sea users, baseline data and information will be collected from the following sources:

Table 17-2 Baseline data sources

Type / description of data	Source	Status
Existing and charted cables	UKHO, KIS-ORCA	Collected - see high level baseline description below
Oil and gas activities	UKDEAL, DECC	
Renewable energy activities	TCE	
Dredging and disposal sites	The Scottish Government, Cefas	

17.2.2 Desk-based review of existing information

Oil and gas activities

The Project lies within oil and gas licensing Quadrant 19. Oil and gas activity is relatively low in this area, and few blocks within Quadrant 19 are licenced. The closest licenced areas to the Exclusivity Area and proposed AfL Area are Blocks 19/4, 19/5 and 19/10. Blocks 19/2, 19/3 and part of 19/10 are in the most recent 27th licencing round application process (DECC, 2013). The closest oil and gas activity is Buzzard, an oil field, which is located in Blocks 20/1 and 20/6 approximately 40 km to the north west of the proposed AfL Area.

The area for which SWL was awarded the Exclusivity Agreement is split into northern and southern parts by the Forties to Cruden Bay pipelines (crude oil) which pass through the area from the northeast to the southwest, shown in Figure 17-1. These pipelines are operated by BP and come ashore at Cruden Bay to connect the Cruden Bay Pressure Relief and Pumping Station, 35 km north of Aberdeen. Onshore pipelines carry the liquids to separation and processing facilities at Kinneil, Grangemouth and Firth Forth.

Further onshore pipelines carry gas liquids from Total's St Fergus gas terminal, ExxonMobil's SAGE terminal and the Shell-operated FLAGS terminal to St Fergus (approximately 7 km north of Peterhead) to join the oil line at Cruden Bay. St Fergus is a landing point for numerous offshore pipelines, the closest of which is approximately 5 km from the cable route corridor and, further offshore, from the proposed AfL Area (Figure 17-1).

Other renewable energy sites

There are currently no operational wind farms in the vicinity of the Project. Two sites on the east coast of Scotland were awarded in TCEs Round 3 licensing round, one in the Moray Firth and one in the Firth of Forth. Three sites have also been awarded in the Scottish Territorial Waters Round; one in the Moray Firth and two in the Outer Firth of Forth. Additionally, two tidal energy projects are currently at the planning stage, one in Esk Estuary in Montrose and one in Burghead in the Moray Firth (The Crown Estate, 2013). There are no wave energy projects planned in the vicinity of the Project.

Marine aggregate extraction

There are currently two areas of marine aggregate production in Scottish waters, one in the Firth of Forth and one in the Firth of Tay. Neither are currently in use (Scottish Government, 2011) or in the vicinity of the Project.

Dredging and sea disposal

Dredging is important to maintain access to Peterhead Harbour. As outlined in Section 11 there are two open disposal sites the North Buchan Ness and Peterhead disposal sites and two closed disposal sites, middle Buchan Ness and middle Buchan Ness B sites close to but not within the export cable route corridor (Figure 17-1).

Submarine cables

There are several existing submarine cables in the vicinity of the Project. These include the active CNS fibre optic cable, owned by BP, which runs alongside the BP Forties to Cruden pipelines that pass through the Exclusivity Area and proposed AfL Area. There are also two inactive cables, both owned by BT, which run through the northern part of the Exclusivity Area and proposed AfL Area from the coast of Peterhead towards Norway (Figure 17-1). A further two subsea cables are understood to pass through the northwest edge of the export cable route corridor to the north of Peterhead. These cables (Peterhead to Alexandrovsk (installed 1914) and Peterhead to Egersund (1924)) have been identified as existing assets by The Crown Estate. However, the exact route and location of these cables is currently unknown (Figure 17-1). Both cables are inactive.

The proposed NorthConnect High Voltage Direct Current (HVDC) interconnector cable which is proposed to link Norway and Scotland crosses the export cable route corridor. The NorthConnect cable corridor crosses the export cable route corridor. Potential interactions between the NorthConnect cable and the export cable will be assessed in detail as part of the cumulative and in-combination assessment (see Section 20).

Recreational fishing

Peterhead is considered an important local centre for sea angling and is ranked 18th out of 26 as a popular launch site. Shore angling is more popular, with the area from Peterhead to Cruden Bay cited as an important shore area for sea angling, ranking 15th most popular out of 30 areas (Radford *et al*., 2009).

Other

There is a charted area of 'foul ground' within the cable route corridor where wires were dumped a number of years ago (Figure 17-1). Anchoring is not recommended in this area of foul ground as the wires pose a snagging threat. No other potential sea users (other than navigation and commercial fisheries which are discussed elsewhere) have been identified.

17.3 Data and information gaps

No data gaps are expected on basis of the proposed desk based review and consultation.

17.4 Identification of potential impacts

Potential impacts and the potential significance of those impacts on other sea users are considered in Table 17-3 below.

Table 17-3 Potential impacts and the potential significance of those impacts on other sea users

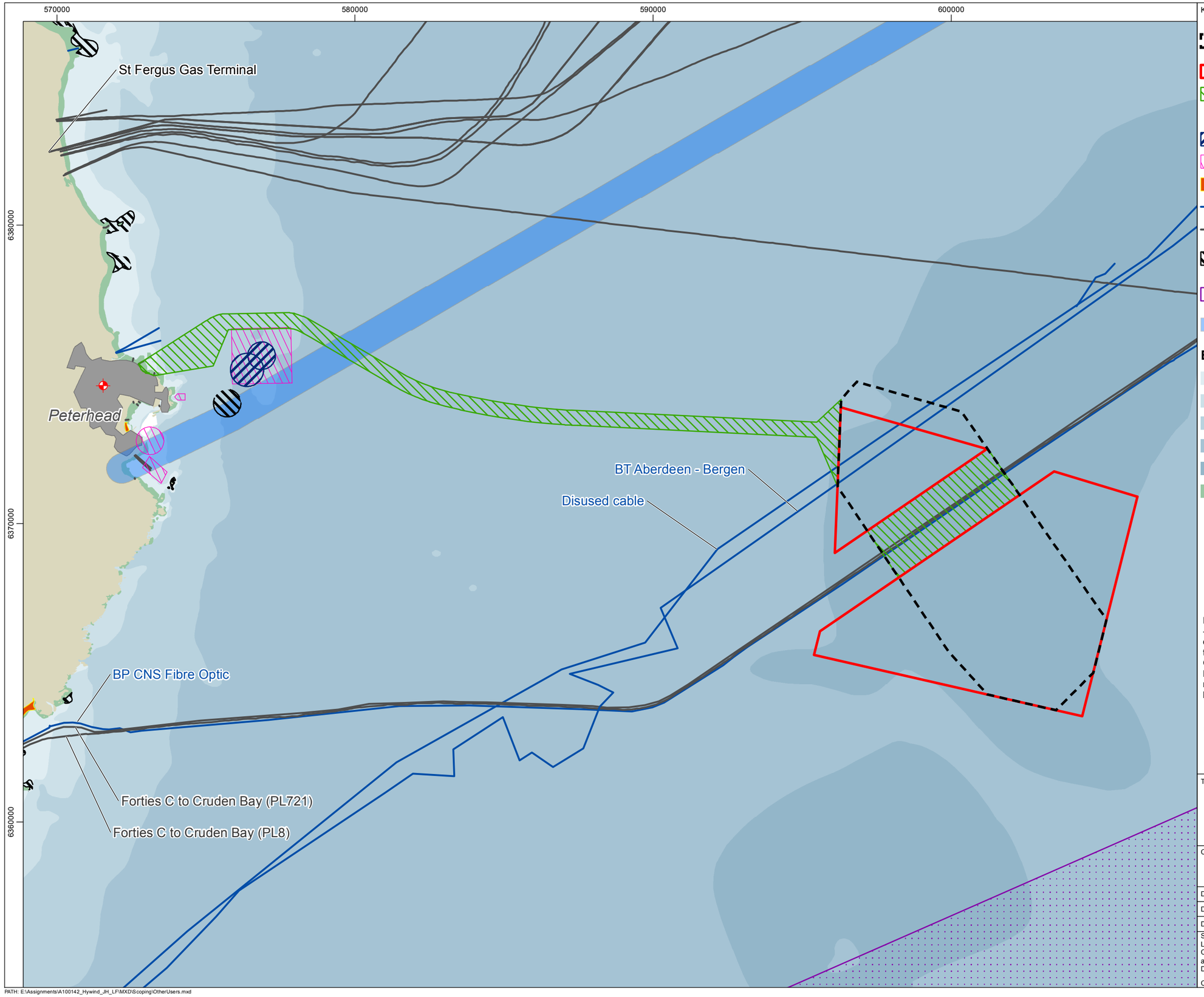
Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Impacts on existing / proposed pipelines and cables	Med	Med	Med	Potential effects of the Project on the BP Forties to Cruden Bay pipelines and the proposed NorthConnect HVDC interconnector cable will need to be assessed in more detail in the EIA. Potential effects associated with the NorthConnect HVDC cable will also need to be considered as part of the assessment of cumulative and in-combination effects.	Yes
Restricting expansion potential of disposal site	Low	Low	No impact	There is potential that installation of the export cable route could restrict possible options to extend the existing disposal site located offshore of Peterhead. However, this is unlikely to be significant.	No
Restriction of sea angling sites at shoreline and offshore	Low	Low	No impact	Although sea angling activities off the coast of Peterhead may be restricted during cable installation these effects will only be temporary and of short duration and therefore are unlikely to be significant.	No
Impacts on activities of other users of the sea	No impact	No impact	No impact	No other sea users identified.	No
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

17.5 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified and those impacts for which the potential level of significance is unknown.

Table 17-4 Impact assessment strategy for other sea users

Potential impact	Assessment method	Relevant guidance
Impacts on existing / proposed pipelines and cables	Desk based study; consultation with pipeline and cable owners	OSPAR Guidance on Environmental considerations for offshore wind farm development, 2008.



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity Area
- Export cable route corridor
- Peterhead Grange substation
- Open disposal site
- Closed disposal site
- Bathing Waters
- Existing cable
- Pipelines
- Foul ground
- Military practice area
- Indicative Northconnect Cable Route 1 km Corridor

Bathymetry (m)

- 0 - 10
- 10 - 20
- 20 - 50
- 50 - 100
- 100 - 200
- Intertidal

Hold: These maps do not show the Peterhead - Alexandrovsk (1914) and Peterhead - Egersund (1924) cables. Both of these cables pass through the north west edge of the cable route corridor, however the GIS route data for both of these cables is currently unavailable. Northconnect route corridor shown is indicative based on maps available on Northconnect website: http://www.northconnect.no/files/31860-E01d_A4-version.pdf

0 0.5 1 1.5 2 nm

0 1 2 3 4 km

N

TITLE:

Figure 17.1
Other sea users in the vicinity of the Project

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:125,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: OtherUsers.mxd			A01

SOURCE: © Crown Copyright, 2013. All rights reserved.
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Disposal sites Cefas. UK DEAL

COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\OtherUsers.mxd

18 SOCIO-ECONOMICS

18.1 Assessment strategy

The proposed strategy for assessing the potential effects of the Project on socio-economics will be based on the following:

Table 18-1 Summary of assessment strategy

EIA Process	Overview of approach	Relevant section
Baseline environment	Desk based study	Section 18.2
Impact Assessment	Assessment of impacts based on information from desk based study	Section 18.6

18.2 Baseline environment – desk based study

18.2.1 Sources of baseline data

As part of the desk based study for the assessment of effects on socio economics, tourism and recreation, baseline data and information will be collected from the following sources:

Table 18-2 Baseline data sources

Type / description of data	Source	Status
> Information on local rates of employment > Local supply chain and business infrastructure > Importance of area for recreation and tourism > Key recreational activities (onshore and offshore)	> Optimat Hywind Scotland Offshore Wind Project: Analysis of Economic Impact – Executive Summary > Census data > NOMIS > Tourism data on VisitScotland website > Consultation e.g. with Sportscotland , local groups (watersports and diving), RYA, seafishing groups > Cross reference to other EIA topics e.g. Shipping and Navigation, Commerical Fisheries, SLVIA.	To be completed as part of EIA

18.3 Data and information gaps

No data gaps are expected on basis of desk based review.

18.4 Identification of potential impacts

Potential impacts and the potential significance of those impacts on socio economics are considered in Table 18-3 below.

Table 18-3 Potential impacts and the potential significance of those impacts on socio-economics

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Direct employment opportunities (local, regional and national)	Positive	Positive	Positive	There is potential for the Hywind Scotland Pilot Park Project to create employment opportunities associated with fabrication, assembly, construction and installation, O&M and decommissioning. However, due to the due to the relatively small scale of the Project e.g. up to 30 MW maximum, it is likely that most employment opportunities will be very localised and in limited numbers and are therefore unlikely to be of major significance. However, longer term, the Project is seen as a crucial stepping stone to the development of larger floating offshore wind commercial developments. The economic benefits of these in terms of job creation will be much more significant.	Yes
Direct Gross Value Added (GVA)	Positive	Positive	Positive	As with the creation of employment opportunities above, positive benefits in terms of GVA are expected to be much greater with the development of much larger, commercial scale Hywind WTG Unit floating wind parks.	Yes
Supply chain impacts	Positive	Positive	Positive	As with GVA, there is potential for the Project to have positive impacts on existing indigenous supply chain active in the offshore wind sector and businesses that have the potential to supply the offshore wind sector. However, these impacts are likely to be of greater significance longer term with the development of much larger, commercial scale Hywind WTG Unit floating wind parks.	Yes
Potential for inward investment	Positive	Positive	Positive	As a stepping stone to larger commercial scale development, the Pilot Park could potentially have positive impacts in terms of generating initial investment interest in the floating offshore wind sector by demonstrating the technical and commercial viability of floating wind technology.	Yes
Impacts on existing tourism and recreational activities	Med	Low	Low	There is potential for construction, O&M and decommissioning activities to disrupt local recreation activities, in particular at the coast during installation of the export cable. However, most impacts will be short term and temporary.	Yes

Potential impact	Potential significance			Comment / justification	Scoped into EIA?
	C/I	O/M	D		
Increased tourism / business interest	No impact	Positive	No impact	There is potential that once operational, the Pilot Park will become a visitor attraction, as with the Hywind Demonstration Project, with potential opportunities for running boat trips out the Pilot Park.	Yes
Key: C/I = Construction and installation, O/M = operation and maintenance and D = decommissioning					

18.5 Approach to assessment of potential impacts

It is proposed that the following impact assessment strategy is applied to address the potentially significant impacts identified.

Table 18-4 Impact assessment strategy for socio-economics

Potential impact	Assessment method	Relevant guidance
Direct employment opportunities (local, regional and national)	Further information on employment opportunities will be considered as part of the EIA.	No specific guidance identified.
Direct Gross Value Added (GVA)	Further information on likely GVA associated with the Pilot Park will be provided in the ES.	No specific guidance identified.
Supply chain impacts	Further information on supply chain requirements will be considered as part of the EIA.	No specific guidance identified.
Potential for inward investment	Potential for forward investment will be investigated as part of the EIA.	No specific guidance identified.
Impacts on existing tourism and recreational activities	Identification of tourism and recreation activities occurring within the Hywind Scotland Pilot Park Project area (offshore and onshore). Impact assessment.	No specific guidance identified.

19 ONSHORE EIA TOPICS

19.1 Introduction

As discussed in Section 1, Aberdeenshire Council determined that the onshore components of the Project are not likely to give rise to any significant effects on the environment and therefore a statutory EIA under the Town and County Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 is not required. However, given that the onshore works form an integral part of the overall Hywind Scotland Pilot Park Project, it is proposed that the EIA for the offshore components of the Project will also include, where necessary, consideration of the onshore components of the Project.

The Project only requires minimal, small scale onshore infrastructure comprising an underground cable and switchgear yard to be located between the cable landfall and the existing Peterhead Grange SSE Substation. The specific location for these facilities is still being investigated and will be informed by on-going engineering studies and constraints mapping. It is unlikely that the onshore components of the Project will be located in any 'greenfield' sites.

Based on feedback received during screening and pre-scoping consultation this section of the Scoping Report summarises the proposed scope of EIA onshore works. Due to the small scale of the proposed works and limited EIA work required all onshore EIA scopes have been summarised in a single section if this Scoping Report (unlike the offshore scopes that are presented in individual sections).

19.2 Onshore EIA topics

The onshore EIA topics identified as requiring consideration with respect to the Hywind Scotland Pilot Park Project include:

- Seascape, Landscape and Visual Impact Assessment (SLVIA);
- Terrestrial ecology;
- Onshore archaeology and cultural heritage;
- Traffic and transport;
- Onshore noise;
- Local air quality (onshore); and
- Public space and amenity.

19.3 Baseline environment – collecting baseline data and information

19.3.1 Overview of onshore environment

The onshore cable route will extend landward from the proposed landfall, which will be located at a point along the coast immediately to the north of Peterhead Harbour, to the point of connection to the grid at Peterhead Grange SSE Substation. The area of search for the landfall extends north along the shore line from a point opposite the road Gadle Braes at the junction with Skene Street to the Scottish Water outfall pipeline and control building. The landfall area of search is composed of a rocky intertidal shore, backed by a concrete sea wall. The seawall bisects the shore from a grass verge on a promenade with a public footpath. The grass verge on the promenade is a mostly open grassy area with the exception of a children's play area and the Scottish Water control building to the north.

The onshore environment from the landfall to the Peterhead Grange SSE Substation comprises built-up suburban landscape, including areas of housing (1930's housing estates), roads and levelled playing fields. A number of areas of land between the proposed landfall site and the Peterhead Grange SSE Substation are identified in the Aberdeenshire Council Local Development Plan as being reserved specifically for community use (Figure 19.1). These include community centres, playing fields and other recreational grounds.

In terms of the built environment, there are a number of places of worship and educational facilities located towards the centre of Peterhead which lies to the south and east of the landfall and substation. There are also several listed buildings and conservation areas (areas of cultural and heritage importance) in the main town area (Figure 19.1). There are no international, national, local designations for nature conservation or RSPB reserves in the Peterhead area. There are also no records of protected species in the vicinity of either the landfall or the substation. There is also no Ancient Woodland or Zones of Natural Heritage Sensitivity. The closest designations to the onshore study area are the Buchan Ness to Collieston Coast Special SPA located approximately 3.5 km to the south, Rora Moss Site of Special Scientific Interest (SSSI) approximately 9 km to the northwest, and Moss of Cruden SSSI located approximately 11 km to the south west.

19.3.2 Sources of baseline data and identification of impacts

Relevant sources of baseline data and potential impacts requiring consideration in the EIA for each of the onshore EIA topics listed above are discussed in Sections 19.4 to 19.10 below.

19.4 Seascape, landscape and visual impact assessment

Table 19-1 Baseline data and information for seascape, landscape and visual impact assessment

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
Desk study	> Identification of Coastal and Landscape Character Areas	> Landscape Character Assessment Review (SNH)	To be completed	No comments
Site visit	> Verification of Coastal Character Areas > Identification of Local Coastal Character Areas / Types > Identification viewpoints	> Not applicable	To be completed	Peterhead is located on a headland with limited seaward views; it is therefore likely that the number of potential viewpoints with views offshore will be relatively low.
Consultation	> Consultation with Aberdeenshire Council and SNH to agree location of viewpoints for visibility maps and visualisations (photomontages)	> Not applicable	To be completed	Given that the Project involves minimal permanent onshore infrastructure only a few onshore viewpoints are expected to be identified.

Table 19-2 Identification of potential impacts, and potential significance of impacts on seascape, landscape and visual impact assessment

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Potential impacts on seascape and visual amenity during construction of the Pilot Park	Low	Low	Low	Due to the small scale of the Pilot Park and distance from shore, potential impacts on visual amenity and seascape during the installation of the WTG Units are unlikely to be significant.	No	Identification of viewpoints, preparation of visibility maps and photomontages to illustrate extent of the visibility of the Pilot Park.	Guidance on assessing the impact on coastal landscape and seascape – guidance for scoping an Environmental Statement (SNH, 2012). SNH commissioned report - An assessment of the sensitivity and capacity of
Potential seascape impacts due to presence of WTG Units	Low	Low	Low	Although the Pilot Park will be located approximately 25 km from the coast, in an area of open sea that is also used for	Yes		

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Potential visual impacts due to the presence of the WTG Units	Low	Med	Low	fishing and oil and gas activities, there is potential that, in clear conditions, the Pilot Park will be visible from Peterhead. Lights from the WTG Units may also be visible at night. In terms of views of the Pilot Park due to its distance offshore, small scale (up to five WTG Units) and location in an area of open water, impacts on seascape are likely to be limited.			the Scottish seascape in relation to offshore windfarms (2005) The Landscape Institute and the Institute of Environmental Management and Assessment (2002) Guidelines for Landscape and Visual Impact Assessment. Second edition SNH Scottish Seascapes Study, Figure 22, p.46 and Appendix D: Description of Seascape Character Types Visual Representation of Windfarms: Good Practice Guidance (SNH, 2007) Cumulative effects of Windfarms (SNH, 2005) Dti (2005) Guidance on the Assessment of the Impact of Offshore Windfarms: Seascape and Visual Impact Assessment
Construction impacts on landscape character and visual amenity	Med	No impact	No impact	Construction impacts on local coastal/landscape character and visual amenity will be temporary and short term. The significance of potential impacts will depend on the location of the landfall, onshore cable route and onshore switchgear yard, methods of installation of the cable at the landfall (HDD or open trench) and along cable route and the size / scale of construction area / compounds and equipment involved.	Yes	Evaluation of local coastal character and local viewpoints, identification of cable installation methods at the landfall and along onshore cable route and sources of impacts on landscape character and visual amenity. Assessment of impacts.	
Impacts on landscape character and visual amenity during operation of onshore switchgear yard	Low	Med	Low	Long term presence of the onshore switchgear yard could also have longer term impacts on local landscape character and visual amenity. The significance of these effects will depend on the location of the onshore switchgear yard in relation to important viewpoints and sensitive receptors	Yes	Characterisation of local landscape character and identification of important viewpoints. Assessment of impacts as part of wider onshore components of the Project.	

19.5 Terrestrial ecology

Table 19-3 Baseline data and information for terrestrial ecology

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
Desk study	> International and national designations > Local designations > Protected species records	> SNH > North East Scotland Biological Records Centre (NESBReC) > Aberdeenshire Council > RSPB	Reviewed as part of onshore constraints mapping exercise.	Urban, built up area, very limited areas of natural habitat. Closest designated site is 3.5 km from onshore study area. No protected species records in area.
Walkover	> Ecological walkover to identify any natural habitats or habitats that could support protected species > Photographs	> Not applicable	To be completed once onshore cable route and location of onshore switchgear yard to be identified.	Due to urban nature of environment along the onshore cable route and at the onshore switchgear yard, identification of sensitive habitats of note is considered unlikely.

Table 19-4 Identification of potential impacts, and potential significance of impacts on terrestrial ecology

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Habitats and protected species disturbance along the onshore cable route from Mean High Water Spring (MHWS) landward	Low	No impact	No Impact	Although records / existing information suggest that the onshore Project area is of low ecological value due to the built up, urban character of the area, this will need to be validated by an ecological walkover. Where sensitive habitats / species are present along the cable route these could be disturbed by cable installation activities.	Yes	Ecological walkover to verify ecological value of onshore Project locations. Ecological impact assessment based on results from the walkover to determine significance of any potential impacts.	Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment (EcIA), Terrestrial, Freshwater and Coastal. 2006
Disturbance or loss of important habitats and protected species at	Med	Low	Low	Construction of the onshore switchgear yard could have localised effects on habitats / protected species. Due to the scale of the proposed development and lack of any	Yes		

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
the onshore switchgear yard				protected species records in the Peterhead area, potential significant effects are unlikely. However, an ecological walkover may be required to confirm the ecological value of the site. Once the onshore switchgear yard is constructed significant effects are unlikely.			

19.6 Onshore archaeology and cultural heritage

Table 19-5 Baseline data and information for onshore archaeology and cultural heritage

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
High level desk study	> Scheduled monuments > Conservation areas > Listed buildings	> Historic Scotland > The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) > Aberdeenshire Council	Reviewed as part of an onshore constraints mapping exercise.	On basis that most of the onshore development area lies in a built up urban area (1930's housing estate, roads, playing fields and concrete coastal defences) most information for the area will be derived from desk based survey sources. The majority of listed buildings and conservation areas are located within the centre of Peterhead, to the south and east of the landfall and Peterhead Grange substation. However, there may be a requirement to conduct a walkover survey of the intertidal zone and seafront on the basis that items here are often omitted from surveys that contribute to desk based sources e.g. World War II defences and intertidal zone wrecks.
Detailed desk study	> Locations of other historical and cultural significance	> National Monuments Records of Scotland (direct access or via Canmore and Pastmap database websites > The Archaeology Data Service (ARCHway and HEIRNET registered databases) > Ordnance survey, geological and historic maps of the Peterhead area > Aerial photographs > Archaeological and historical journals, monographs and logs including the Old and New Statistical Accounts of Scotland > Historic documents > Unpublished material	To be collected and reviewed.	
Walkover	> Walkover survey to identify any further visible sites of archaeological/heritage importance not previously recorded and evaluate the importance of historic assets identified from the desk study	> Not applicable	To be completed once onshore cable route and location of onshore switchgear yard identified (if necessary).	

Table 19-6 Identification of potential impacts, and potential significance of impacts on onshore archaeology and cultural heritage

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Potential direct disturbance to / damage of known and unknown assets of cultural and historical importance	Med	No impact	No impact	The potential for known and unknown assets and features to be directly disturbed or destroyed during cable installation is likely to be limited due to the built up / suburban nature of the onshore Project area. However, further desk study is required to establish the potential cultural and historical value of the Onshore Project area in order to determine the potential significance of any impacts.	Yes	Desk study to establish cultural and historical value of the onshore Project area. Possible walkover to previously unrecorded sites in particular at the coast. Assessment of impacts.	Planning Advice Note (PAN 58) Environmental Impact Assessment (1999); Scottish Planning Series Planning Circular 3-2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. Historic Scotland's Managing Change in the Historic Environment guidance series. The Institute for Archaeologists (IfA) Codes, Standards and Guidance (http://www.archaeologists.net/modules/icontent/index.php?page=15). COWRIE Ltd's Historic Environment Guidance for the Offshore Renewable Energy Sector (2007), by Wessex Archaeology Ltd.
Potential indirect disturbance to / damage of known and unknown assets of cultural and historical importance	Low	No impact	No impact	Due to the character of the onshore works, it is unlikely that there will be any indirect effects on known and unknown assets of cultural and historical importance. Therefore these impacts will not be considered further in the EIA.	No	Not relevant as scoped out of the EIA.	Not applicable

19.7 Traffic and transport

Table 19-7 Baseline data and information for traffic and transport

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
Desk study	> Local road network > Highway and junction capacity > Traffic volumes > Road safety statistics > Accident hot spots > Cycleways and footpaths > Bus routes	> Aberdeenshire Council Highways Department > Ordnance survey maps > Aberdeenshire Local Plan	To be collected and reviewed.	Due to the temporary and short term nature of the cable installation / onshore switchgear yard construction activities traffic surveys are unlikely to be required to inform the assessment of potential impacts on traffic and transport.
Walkover	> Walkover to evaluate junction and highway capacity	> Not applicable	To be completed once onshore cable route, location of onshore switchgear yard and landfall identified.	Walkover is likely to be required to evaluate the existing capacity of the local road network (including junctions) to accommodate onshore construction works e.g. import of HDD or open trench machinery and equipment for the onshore switchgear yard some of which will be transported on large, heavy load articulated lorries.

Table 19-8 Identification of potential impacts, and potential significance of impacts on traffic and transport

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Disruption to local traffic flow	Med	No impact	No impact	There is potential that onshore construction activities could lead to temporary, short term and localised disruptions in traffic flow / movements due to diversions where onshore construction activities are taking place. This could also be temporary effects on traffic flow / movements elsewhere in Peterhead where diversions or road closures lead to increased congestion on other roads / access routes.	Yes	Walkover. Consultation with Aberdeenshire Council Impact assessment.	Design Manual for Roads and Bridges: Volume 11 – Environmental Assessment ((Highway Agency 2011) as Amended. Institute of Environmental Assessment (IEA, 2003) – Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic (IEA, 2003).
Alterations in volumes of traffic on local roads	Med	No impact	No impact	It is likely that onshore construction equipment (e.g. HDD drilling rigs, excavators, cable drums and transformers (if required)) will be transported to site on large articulate lorries, leading to a possible temporary, short term increase the volume of traffic on roads in Peterhead.	Yes		
Road traffic congestion associated with transport of offshore components of the Pilot Park	No impact	No impact	No impact	It is not expected that any of the offshore components of the Pilot Park will be transported by road as the WTG Units will be towed by boat to the Pilot Park development site fully assembled. It is also likely that the export cable will be transported to Peterhead by boat.	No	Not relevant as scoped out of EIA	Not applicable

19.8 Onshore noise

Table 19-9 Baseline data and information for onshore noise

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
Desk study	> Identification of sensitive receptors e.g. schools, hospitals, residential properties etc	> Ordnance survey maps > Aberdeenshire location plan	To be collected and reviewed	Although onshore construction activities are temporary and short term in nature, operations could potentially generate noise during the construction period. Noise surveys are therefore likely to be required to determine the likely significance of any impacts from noise on local residents / other sensitive receptors.
Noise survey	> Noise survey to establish baseline noise levels at the landfall site and onshore switchgear yard location once identified	> Survey will be carried out in accordance with BS 7445: Description and measurement of environmental noise. Measurement locations and survey method will be agreed with Aberdeenshire Council prior to surveys commencing.	To be completed once onshore cable route and location of onshore switchgear yard and landfall identified.	

Table 19-10 Identification of potential impacts, and potential significance of impacts on onshore noise

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Noise impacts at the cable landfall	Med	No impact	No impact	There is potential noise to be generated from activities at the cable landfall (HDD or open trenching through a rocky foreshore). The significance of any impacts resulting from noise will depend on the main sources of noise, how the expected levels of noise compare to existing noise levels in the area and the frequency and duration of the noise e.g. hours per day and duration of cable installation operations.	Yes	Identification of sensitive receptors. Identification of sources and levels of noise from activities at the landfall, along the cable route and at the onshore switchgear yard. Noise monitoring to establish existing background noise levels	Planning Advice Note 1/2011: Planning and Noise BS5228-1:2009 – Code of Practice for noise and vibration control on construction and open sites Design Manual for Roads and Bridges: Volume 11 – Environmental Assessment ((Highway Agency 2011) as

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Noise impacts during cable installation	Med	No impact	No impact	There is potential for noise to be generated during cable installation and construction of the substation. There could also be some noise generated during operation and decommissioning of the substation. The significance of any impacts resulting from noise will depend on the main sources of noise, how the expected levels of noise compare to existing noise levels in the area and the frequency and duration of the noise e.g. hours per day and duration of cable installation operations.	Yes	(baseline) for the purpose of the impact assessment.	Amended
Noise impacts at the onshore switchgear yard	Med	Low	Low		Yes		

19.9 Local air quality (onshore)

Table 19-12 Baseline data and information for local air quality (onshore)

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
Desk study	> Existing air quality in Peterhead	> 2012 Air Quality Updating and Screening Assessment for Aberdeenshire Council – Diffusion tube monitoring results for NO2 in Peterhead town centre	Reviewed	Results for Peterhead indicate that NO_2 levels are below NAQS objectives. No further additional baseline data or survey work will be required with respect to the Project.

Table 19-13 Identification of potential impacts, and potential significance of impacts on local air quality (onshore)

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Generation of dust during onshore construction	Low	No impact	Low	Although there is potential for dust to be generated from onshore construction activities any emissions will be managed through following construction best practice and site management procedures. Potential impacts on local residents are unlikely.	No	Not relevant as scoped out of EIA	Not applicable

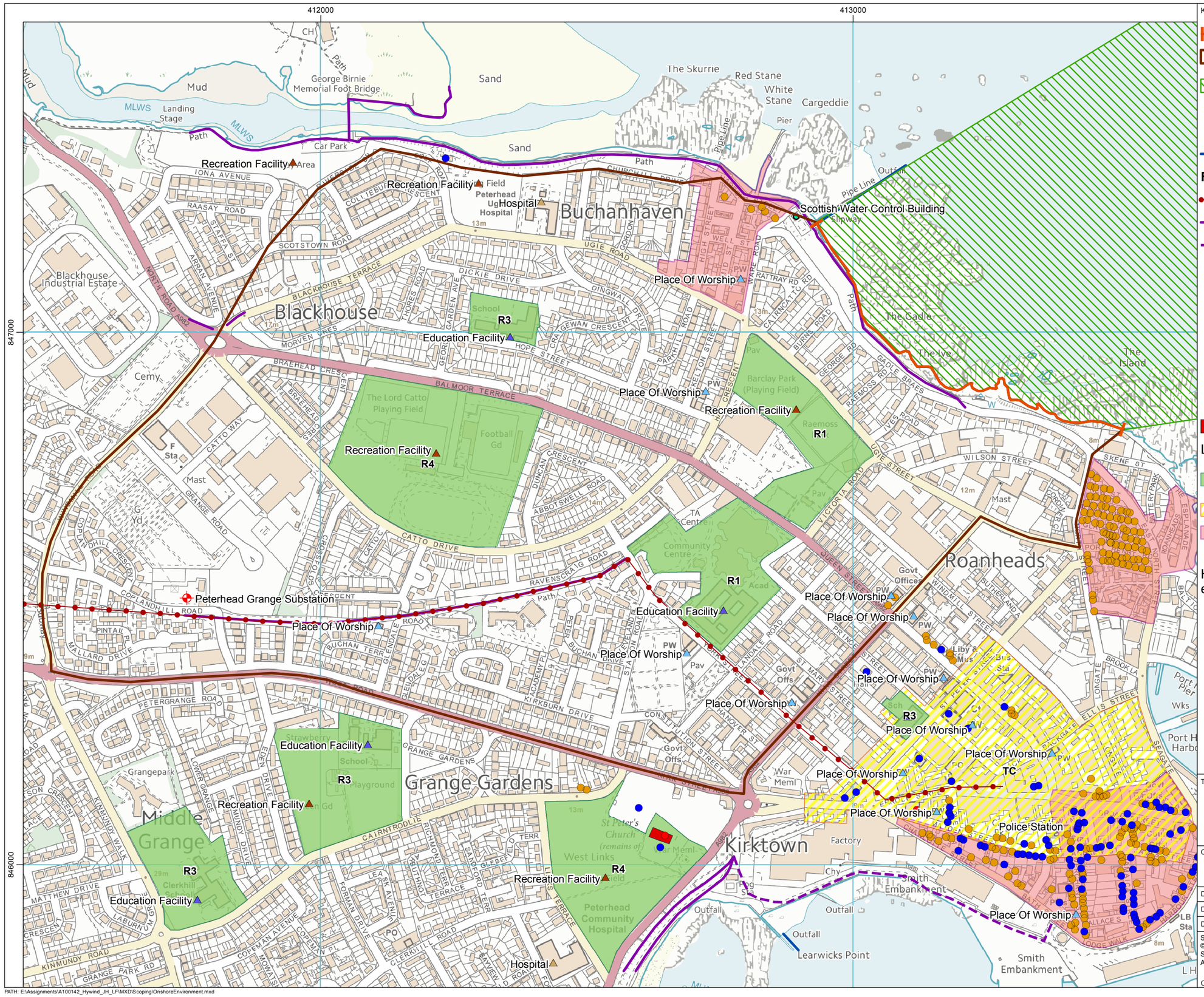
19.10 Public space and amenity

Table 19-14 Baseline data and information for public space and amenity

Baseline data collection strategy	Type / description of data	Data sources	Status	Comments / observations
Desk study	> Playing / sport fields and recreational grounds > Public open space / parks > National Cycleway Network > Footpaths and National trails > Bridleways > Local cycleways > Bathing beaches > Greenbelt	> Aberdeenshire Council Local Plan	To be collected and reviewed	There are a number of areas identified in the Aberdeenshire Local Development Plan as being reserved for community use. These areas currently comprise sports fields, recreational grounds, community and leisure facilities.

Table 19-15 Identification of potential impacts, and potential significance of impacts on public space and amenity

Potential impact	Potential significance			Comment / justification	Scoped into EIA?	Assessment method	Relevant guidance
	C/I	O/M	D				
Disruption to use of public space and amenity during onshore construction	Low	No impact	Low	There is potential that onshore construction activities could lead to temporary reductions in access to areas of community / public open space. These impacts will be temporary and short terms and, due to the anticipated scale of the works are not expected to be significant.	No	Not relevant as scoped out of EIA	Not applicable
Impacts on use of public space and amenity due to presence of onshore switchgear yard	Low	Low	Low	Long term presence of the onshore switchgear yard could affect long term use of areas of community / public open space. However, due to the small scale of the onshore switchgear yard it is unlikely that these impacts will be significant.	No	Not relevant as scoped out of EIA	Not applicable



KEY:

- Landfall area of search
- Onshore cable route corridor
- Export cable route corridor
- Peterhead Grange substation
- Scottish Water Control Building
- Outfalls

Footpaths

- The Formartine and Buchan Way
- Adopted Core Path
- Aspirational Core Path
- Education Facility
- Hospital
- Place Of Worship
- Recreation Facility
- Listed Building Category A
- Listed Building Category B
- Listed Building Category C
- Scheduled Monument

Local Development Plan

- Land reserved for community use (Policy 8)
- Retail Centres (Policy 2)
- Conservation Areas

Hold: Core paths are not shown to full extent of map due to lack of data

0 100 200 300 m

N

TITLE:

Figure 19.1
Overview of onshore environment

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:7,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: OnshoreEnvironment.mxd			A01

SOURCE: Contains Ordnance Survey data
© Crown copyright and database right 2013
Statoil, Historic Scotland
Aberdeenshire Council Local Plan LDPPart3Buchan.pdf

COORDINATE SYSTEM: British National Grid

xodus GROUP

PATH: E:\Assignments\A100142_Hywind_JH_LF\MXD\Scoping\OnshoreEnvironment.mxd

20 CUMULATIVE AND IN-COMBINATION EFFECTS

20.1 Introduction

Cumulative and in-combination impacts will be considered as an integral aspect of the EIA process and will be considered for all phases of the Project. This section aims to identify the main projects which, together with the Project, may result in potential cumulative or in-combination impacts. These projects will then be assessed as part of each of the specialist EIA studies to determine how the proposed Hywind Scotland Pilot Park may interact with other on-going and planned projects and activities.

20.2 Projects to be considered for cumulative and in-combination impacts

The general principle for the proposed cumulative and in-combination impact assessment is to consider only those projects that are at EIA scoping stage (i.e. for those Projects that formally require an EIA scoping response such as those that require Marine Licence and for which an EIA Scoping Report has been submitted,) or a Proposal of Application Notice (for Major onshore projects) has been submitted to Aberdeenshire Council, and beyond.

Inevitably the assessment of these 'future projects' is dependent upon the level of information available on those projects at the time of undertaking the cumulative assessment. Due to the fact it is expected different levels of detail will be available for different projects, the cumulative impact assessment is proposed to be undertaken qualitatively. Sufficient data is unlikely to be available in the public domain to allow a fully quantified cumulative impact assessment.

Table 20-1 provides a list of the projects SWL proposes to consider from a cumulative and in-combination impact assessment perspective at present. The location of these projects is shown in Figure 20-1 and Project details also presented in Table 20-1. Marine Scotland and its advisors are asked to confirm in the Scoping Opinion that all relevant projects have been identified.

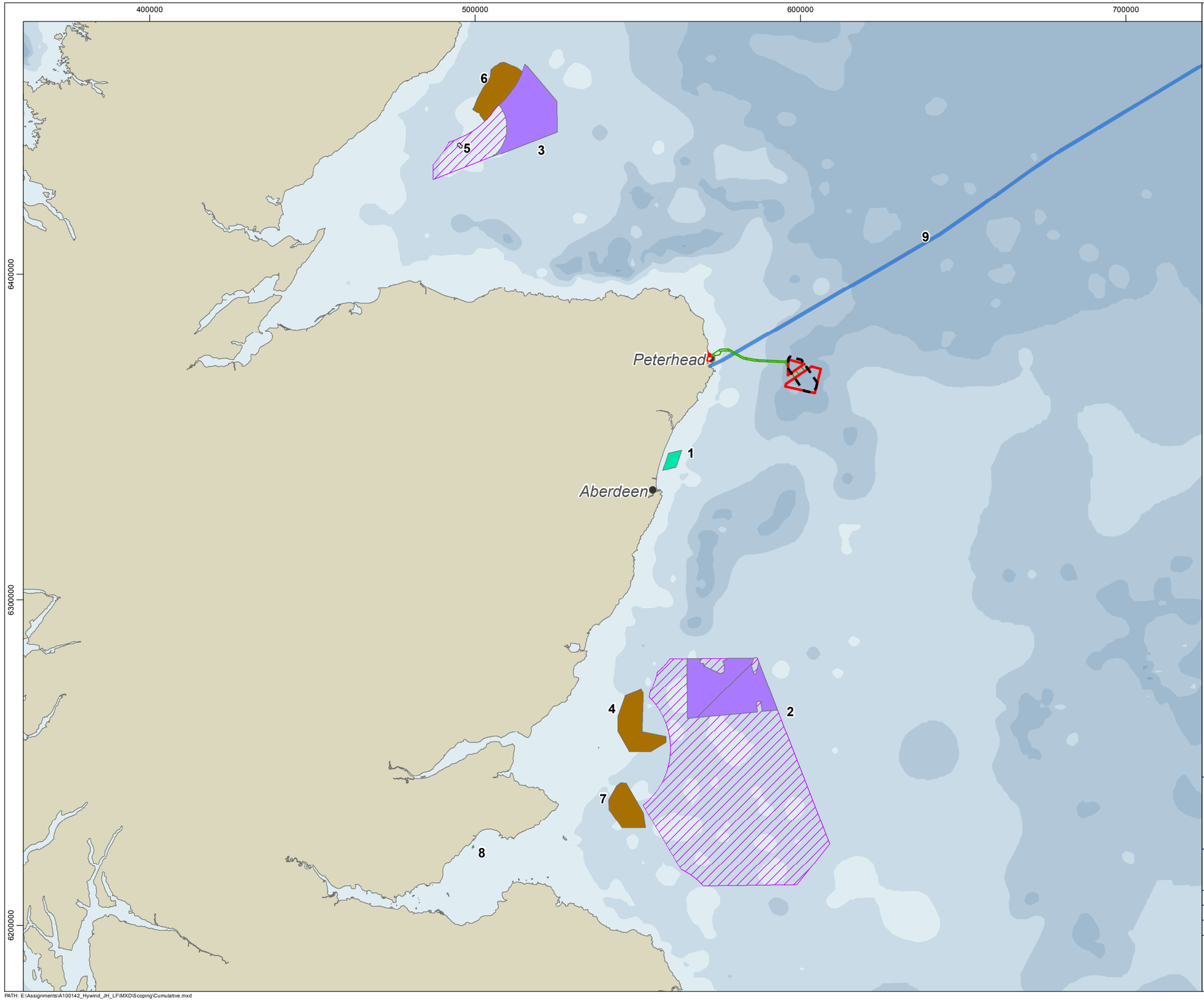
The projects that are to be considered in a cumulative and in-combination impact assessment will differ from receptor to receptor depending on the nature of the impacts associated with a specific EIA topic e.g. whether impacts are site specific or affect receptors in a wider area. The potential for individual projects to result in cumulative or in-combination impacts will also depend on the type and scale of the project, distance of the project from the Hywind Scotland Pilot Park Project and the nature of the impacts associated with the Project.

Due to the nature and small scale of the proposed onshore infrastructure associated with the Project, it is proposed that only offshore projects are considered as part of the cumulative and in-combination impacts assessment.

Table 20-1 Projects identified for cumulative and in-combination impact assessment

Map ref Fig 20.1	Project name	Distance from Pilot Park	Project developer	High level description	Project status (as of September 2013)
Offshore wind farm projects					
1	European Offshore Wind Deployment Centre (EOWFL)	37 km	Aberdeen Offshore Wind Farm Ltd	Offshore wind turbine deployment centre for 11 turbines with up to 100 MW capacity.	Consented.
2	Firth of Forth	83 km	Seagreen Wind Energy Limited	Offshore wind farm and export cabling to be developed in three Phases with a total target capacity of 3.5 GW. Phase 1: Alpha and Bravo. 1,050 MW, export cable to Carnoustie in Angus. Phase 2: Charlie, Delta and Echo. Phase 3: Foxtrot and Golf.	Phase 1 – offshore EIA submitted. Phase 2 & 3 – EIA Scoping opinion issued.
3	Moray Offshore Renewables Wind Farm (eastern development area)	99 km	Moray Offshore Renewables Ltd (MORL)	A 1,500 MW wind farm over an area of 125 km^2 in the outer Moray Firth. Includes an export cable approximately 105 km in length offshore to Fraserburgh and 30 km onshore to substation.	EIA submitted. Construction planned to begin Q3 2015 to full generation in Q3 2020.
4	Inch Cape Offshore Wind Farm	103 km	Inch Cape Offshore Wind Farm Ltd	Offshore wind farm up to 213 turbines, covering an area of up to 150 km^2 with capacity of approximately 1,000 MW.	Offshore consent application (with EIA) submitted July 2013.
5	Beatrice Offshore Wind Farm Demonstrator Project	118 km	SSE and Talisman	A two-turbine (10 MW) demonstrator project.	Operational.

Map ref - Fig 20.1	Project name	Distance from Project	Project developer	High level description	Project status (as of September 2013)
6	Beatrice Offshore Windfarm Ltd (BOWL)	118 km	SSE	An offshore wind farm with a maximum of 227 offshore turbines, generating up to 1,000 MW in the outer Moray Firth. Includes an electrical transmission cable along a 65 km corridor to the shore at Portgordon and 20 km of onshore cable to a new substation at Blackhill hock.	Offshore EIA addendum submitted May 2013 for the wind farm. Onshore transmission works planning granted.
7	Neart na Gaoithe Offshore Wind Farm	131 km	Mainstream Renewable Power	Offshore wind farm, 75- 125 turbines, 450 MW with 33 km export cable to shore.	EIA submitted March 2013. Offshore construction due to being in 2015 subject to consent. Consent for onshore works awarded June 2013.
8	Fife Energy Park Offshore Demonstration Wind Turbine	170 km	Fife Energy Park	Consent granted to test a single offshore wind turbine.	Consented.
Other marine projects					
9	NorthConnect	0 – 30 km (depending on cable route)	NorthConnect	Onshore component of NorthConnect Project for HVDC cable between Norway and UK. Erection of converter station, underground cabling and association infrastructure and improvement works.	Submission of proposal application notice.
N/A - no spatial data available	Eastern HVDC Link	0 – 30 km (depending on cable route)	SSE and National Grid Electricity Transmission	Upgrade of existing infrastructure in Peterhead (upgrade of existing HDVC converter station at existing power station) and installation of a subsea HDVC cable from Peterhead to Teeside. Project delivery expected 2017 / 2018.	EIA Scoping Opinion issued for marine works.



KEY:

- Proposed Agreement for Lease (AfL) Area
- Hywind Scotland Exclusivity
- Export cable route corridor
- Peterhead Grange substation
- Indicative Northconnect Cable Route 1 km Corridor
- Round 3 Wind Farm Site
- Round 3 Wind Farm Zone
- Demonstration / Test Facility Wind Farm Site
- Pilot Wind Farm Site
- Scottish Wind Farm Site

Bathymetry (m)

- 200 - 500
- 100 - 200
- 75 - 100
- 50 - 75
- 0 - 50

Note
-Numbers relate to projects detailed in Table 20.1
-Spatial information on SSE Eastern HDVC link unavailable
-Northconnect route corridor shown is indicative based on maps available on Northconnect website:
http://www.northconnect.no/files/31860-E01d_A4-version.pdf

0 5 10 15 20 nm

0 10 20 30 40 km

N

TITLE:

Figure 20.1
Projects to be considered in cumulative and in-combination impact assessment

CLIENT: Statoil

DATE: 30/09/2013	SCALE:1:1,150,000	PROJECT: A100142	A3
DRAWN: JH	CHECKED: SE	APPROVED: LF	
DRAWING: Cumulative.mxd			A01

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UK DEAL, The Crown Estate, GEBCO

COORDINATE SYSTEM: WGS 1984 UTM Zone 30N

xodus GROUP

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21 HRA STRATEGY

21.1 Introduction

The Habitats Directive affords protection to European sites designated under the Habitats Directive (Special Areas of Conservation (SACs)) and the Birds Directive (Special Protection Areas (SPAs), collectively referred to as Natura or European sites. Under Article 6(3) of the Habitats Directive (EC Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna) any *plan or project which is not directly connected with or necessary to the management of a European site but would be likely to have a significant effect on such as site, either individually or in-combination with other plans and projects, shall be subject to an appropriate assessment of its implications for the European site in view of the site's conservation objectives*."

The Habitats Directive applies the precautionary principle to these sites and projects can only be permitted when it is ascertained that there will be no adverse effect on the integrity of the site(s) in question. Where adverse effects are identified a projects may only be permitted in the absence of alternative solutions if there is an Imperative Reason of Overriding Public Interest (IROPI) for the project to go head. Where this is the case, Member States are required to take all compensatory measures necessary to ensure that the overall coherence of the Natura 2000 network is protected.

The Habitats Directive is transposed in Scotland by the Conservation (Natural Habitats &C) Regulations 1994 (as amended) for onshore areas and marine areas out to 12 nm. For offshore areas (12 nm to 200 nm) requirements of the Habitats Directive are transposed through the Offshore Marine Conservation Natural Habitats Regulations (2007) as amended. In accordance with these Regulations, the effects of a project on the integrity of a European site are assessed and evaluated as part of the Habitat Regulations Appraisal (HRA) process. The proposed strategy and approach for carrying out an HRA of the Hywind Scotland Pilot Park Project is described below.

21.2 Proposed HRA Strategy

The following section provides an overview to the HRA process and sets out the proposed approach to completing HRA screening and providing information to inform an Appropriate Assessment of the Hywind Scotland Pilot Park Project.

The HRA will be undertaken as an integral part of the EIA process. It is proposed that the information collected to inform the HRA in relation to both screening and assessment of effects on site integrity will be presented as an Appendix to the main ES. This will help to ensure that information from the EIA is included in the HRA and vice versa.

It is proposed that HRA screening will be undertaken on receipt of Scoping Opinions from Marine Scotland and Aberdeenshire Council. This will enable us to ensure that the HRA screening process takes full account of advice from the statutory nature conservation bodies included in the Scoping Opinions on HRA issues, including the initial identification of sites (SPAs and SACs) identified as requiring consideration as part of the HRA and advice on the information to be provided to the competent authority to support an Appropriate Assessment of the Project.

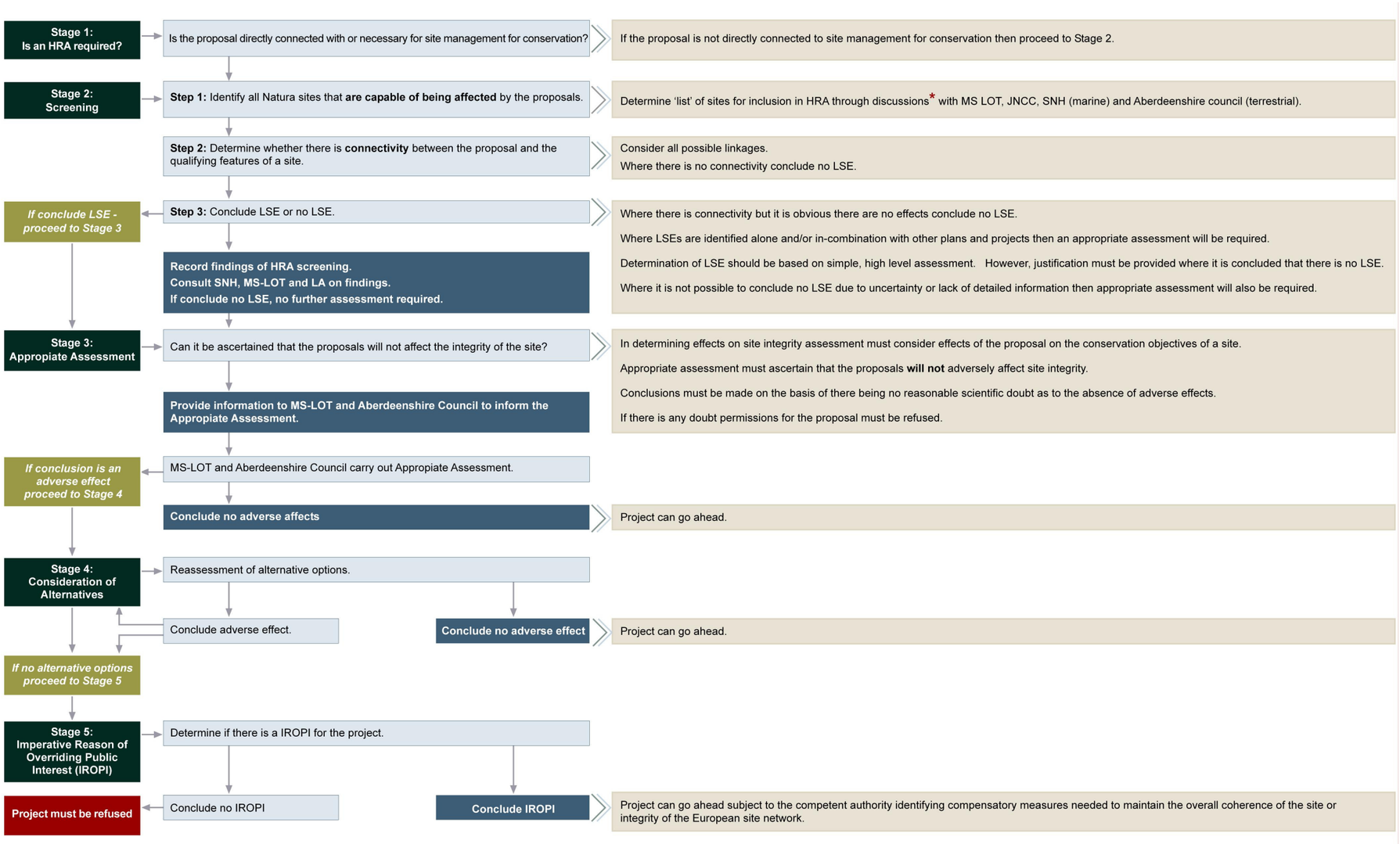
Based on current Project timescales, we anticipate that HRA screening will be carried out in early 2014. Findings from HRA screening will then be provided to Marine Scotland and Aberdeenshire Council for discussion. The HRA information required by Marine Scotland and Aberdeenshire Council to inform any Appropriate Assessment will be provided in an appendix to the ES. The HRA Appendix will then be completed for submission with the ES and NRA as part of the Marine Licence and onshore planning consent applications.

A summary of our proposed strategy for the HRA, including identification of the main topics that are likely to require consideration is provided in Section 21.4.

21.3 Overview of the HRA process

The HRA process is split into a series of stages. These are illustrated in Figure 21-1.

Figure 21-1: Overview of the HRA Process (based on SNH Guidelines, 2010)



* Discussions with MS LOT, JNCC, SNH and relevant Aberdeenshire Council may need to be on-going depending on timing of assessment, availability of information from modelling, surveys or monitoring etc. and level of detail available on the proposals.

21.4 Approach to carrying out the HRA

21.4.1 Stage 1: Determining whether an HRA is required

Taking into account the nature of the Project (offshore wind farm), its location in relation to SPAs and SACs located along the east coast of Scotland, and the fact that the Project is not directly connected with or necessary for the management of a European site for nature conservation, it is determined that an HRA will be required. The proposed approach to carrying out the HRA is provided below.

21.4.2 Stage 2 HRA Screening

The main aim of screening is to scope out sites that do not require further consideration under Stage 3 (Appropriate Assessment) on the basis that there will be no likely significant effects on these sites. This includes all 'candidate' SACs (cSACs) and all proposed SACs and SPAs (pSACs and pSPAs) as well as those sites with full SPA and SAC status. In line with SNH guidelines on the HRA process (SNH, 2010), and advice provided by SNH and JNCC in response to the Seabird Discussion Document (Xodus, 2013) HRA screening of the Hywind Scotland Pilot Park Project will involve the following steps.

Table 21-1: Strategy for HRA screening

Requirements	Suggested information to be provided
Step 1: Identification of Natura sites that are capable of being affected by the Project	
Identification of Natura sites[6] that are capable of being affected by the Project based on their qualifying interests, their geographical position in relation to the proposed AfL Area and export cable route corridor and the nature of the Project.	Series of tables listing following sites and associated qualifying and assemblage qualifier species for those sites: > SPAs designated for seabird species identified from the seabird surveys as being present in seabird survey area. > SPAs designated for migratory wildfowl species with migration routes that pass through the Exclusivity Area and proposed AfL Area, in particular Svalbard barnacle goose. > SACs designated for marine mammal species identified as being present within the seabird survey area and surrounding area / coast e.g. seal colonies / haul outs. > SACs designated for diadromous fish with migration route that pass through the Exclusivity Area and proposed AfL Area and along the export cable route. The Project is not located within an area designated for Annex I Habitat (SAC) therefore it is expected that these sites will not need to be considered in the HRA. Due to the urban character of the terrestrial environment and nature of the onshore works it is also unlikely that SACs designated for terrestrial habitats or species will need to be included in the HRA. Onshore SPAs designated for migratory birds are identified above.
Step 2: Determining connectivity	
Determine whether there is connectivity between the Project and the qualifying interests of the sites	Information for individual qualifying and assemblage qualifier species associated with sites identified in Step 1 including:

[6] Sites designated under the Habitats and Birds Directives.

Requirements	Suggested information to be provided
identified during Step 1.	> Foraging distances (seabirds) based on most up to date mean max foraging information available for species of concern e.g. Thaxter *et al.,* 2012. > Migration routes (migratory wildfowl) – specific criteria (distances / routes etc.) to be defined as part of screening process. > Foraging, breeding and migratory behaviour (marine mammals and fish) – specific criteria to be defined as part of screening process.
Step 3: Conclude LSE or no LSE	
Where there is connectivity between a site and the Project carry out high level assessment of Likely Significant Effects (LSEs).	Where there is connectivity between the Project and a site in order to conclude LSE or no LSE, it is necessary to: > Establish the range of impacts that the Project could have on qualifying interest(s) of a site (impact pathways); > Determine whether that qualifying feature(s) would, by virtue of its behavioural and foraging characteristics, be affected by a particular impact (species sensitivity); and > Where a qualifying feature is likely to be affected by an impact, identify whether or not this is likely to have a significant effect on the conservation objectives for the site (conclusion of LSE or no LSE). The definition of a likely effect is one that cannot be ruled out on the basis of objective information (SNH, 2012a). Where there is potential for the conservation objective to be undermined LSE should be concluded. However, if it is obvious that the Project will not have an effect on a qualifying interest, despite a connection, then it should be concluded that there will be no LSE (SNH, 2010).

Reporting

Information and results from Stage 2: HRA Screening will be presented in a HRA Screening Report which will be submitted to Marine Scotland and Aberdeenshire Council as part of consultation on the SAC and SPA sites requiring further assessment under Stage 3: Appropriate Assessment on the basis that there is potential for LSE to occur. It is expected that the HRA Screening Report will be submitted to Marine Scotland and Aberdeenshire Council in early 2014, following receipt of EIA Scoping Opinions.

21.4.3 Step 3: Appropriate Assessment

For the sites where a LSE is identified more detailed assessment is required to determine whether the Project will have an adverse effect on the integrity of the site based on the conservation objectives of the site.

To enable Marine Scotland and/or Aberdeenshire Council to make an Appropriate Assessment the HRA Appendix will be required to contain the following information:

> Identification of the Area of Interest (for example for seabirds the proportion of the seabird survey area that is likely to be affected by the Project). This is likely to be different for birds, marine mammals and fish;

> Identification of effects of the Project on specific species (qualifying interests) presented in the survey area and Area of Interest e.g. disturbance / displacement, collision risk, indirect effects on prey species, pollution;

> For qualifying interests identified as having potential to be affected by the Project information on the proportion of the regional breeding population and SPA / SAC population that is present in the Area of Interest;

- Identification of main activity occurring in the survey area and Area of Interest for each qualifying interest e.g. feeding (seabirds and marine mammals), migration (marine mammals and fish);
- Identification of seasonal variations in species abundance, distribution and use of the site;
- Determination of the importance of the survey area and Area of Interest for each qualifying interests;
- Where affected qualifying interests are part of an SPA or SAC determination of the % of population likely to be affected by the Project and how this will affect the relevant site conservation objectives for that species; and
- Assessment as to whether there will be an adverse effect on the overall integrity of the site.

To provide the information listed above, it will be necessary, through discussion with Marine Scotland, JNCC and SNH to agree how data from the ESAS survey (seabird and marine mammal data) will be analysed in order to obtain suitable data for inclusion in the HRA Appendix. It will also be necessary to establish specific criteria and thresholds against which potential effects will be assessed and to identify other relevant information that will be required to inform the assessment of effects of site integrity e.g. data on regional populations and population trends.

Reporting

As discussed in Section 21.2, information from Stage 3 required to support Marine Scotland and Aberdeenshire Council's Appropriate Assessment will be presented as an appendix to the Hywind Scotland Pilot Park Project ES. The proposed structure of the Appendix document, and detail of the information to be provided, will be presented in the HRA Screening Report for discussion with Marine Scotland and Aberdeenshire Council at the end of Stage 2.

22 CONCLUSIONS

The table below summarises the potential impacts that are proposed to be scoped into and out of the Hywind Scotland Pilot Project EIA based on information presented in Sections 6 to 19. .

Table 22-1 Potential impacts proposed to be scoped into and out of the Hywind Scotland Pilot Project EIA

Potential impact	Scoped into EIA			Scoped out of EIA
	C/I	O/M	D	
Ornithology				
Vessel disturbance	✓			
Collision risk – mortality due to collision with rotor blades		✓		
Displacement (avoidance) due to presence of WTG Units		✓		
Indirect effects from changes in habitat and distribution / abundance of prey species		✓		
Pollution due to leaks and spills from vessels and WTG Units				✓
Benthic and intertidal ecology				
Direct loss of, and disturbance to, seabed and intertidal habitats and communities	✓	✓	✓	
Indirect effects on seabed habitats and communities due to changes in sediment transport /scouring within the Pilot Park		✓		
Colonisation of infrastructure in the water column and on the seabed		✓		
Protection of benthic habitats within the Pilot Park due to restricted trawling in the Pilot Park		✓		
Introduction of marine non-native species				✓
Pollution due to leaks and spills from vessels and WTG Units				✓
Fish and shellfish				
Noise disturbance	✓		✓	
Electromagnetic effects (EMF)		✓		
Loss of spawning and nursery grounds		✓		
Risk of entanglement for large fish species		✓		
Fish aggregating potential of development		✓		
Smothering of fish habitat				✓
Pollution due to leaks and spills from vessels and WTG Units				✓
Marine mammals and turtles (including marine noise)				
Corkscrew injuries	✓	✓	✓	
Risk of entanglement for marine mammals		✓		
Indirect effects from changes in habitat and distribution / abundance of prey species		✓		

Potential impact	Scoped into EIA			Scoped out of EIA
	C/I	O/M	D	
Noise disturbance	✓		✓	
Pollution due to leaks and spills from vessels and WTG Units				✓
Physical processes and sediment dynamics				
Introduction of scour within the Pilot Park		✓		
Effects on the coastline at cable landing the export cable landfall.	✓	✓		
Changes to wave climate				✓
Changes to local currents				✓
Changes to sediment transport and morphology				✓
Sediment and water quality				
Pollution of the water and sediment environment through the disturbance of existing contaminated sediments	✓		✓	
Pollution of sediment and water column from planned releases from WTG Units ballast				✓
Pollution of sediment and water column from unplanned leaks and spills (vessels / WTG Units)				✓
Marine air quality and climate				
All impacts on air quality and climate				✓
Commerical fisheries				
Loss of access to fishing grounds	✓	✓		
Navigational and collision risk	✓	✓	✓	
Fishing gear and anchor interaction	✓	✓		
Electromagnetic effects (EMF)		✓		
Change in abundance of targeted species		✓		
Shipping and navigation				
Navigational and collision risk	✓	✓	✓	
Rotor blade and sailing yachts mast interaction		✓		
Vessel traffic re-routing due to presence of installation vessels / WTG Units and associated safety zones	✓	✓	✓	
Fishing gear and anchor interaction	✓	✓		
Interaction between WTG Units and marine electronics equipment		✓		
Loss of station	✓	✓	✓	
Marine archaeology and cultural heritage				
Potential direct disturbance to or loss of known and unknown assets and features of cultural and historical importance in the marine environment.	✓		✓	
Potential indirect loss of known and unknown assets and features of cultural and historical significance in the marine environment.				✓

Potential impact	Scoped into EIA			Scoped out of EIA
	C/I	O/M	D	
Military, aviation and radar and UXO				
Interference with aviation e.g. helicopter routes		✓		
Interference with radar		✓		
Inadvertent detonation with consequent damage to equipment or injury to personnel from interaction with UXO	✓	✓	✓	
Interference with military activities				✓
Other sea users				
Impacts on existing / proposed pipelines and cables	✓	✓	✓	
Restricting expansion potential of disposal site				✓
Restriction of sea angling sites at shoreline and offshore				✓
Impacts on activities of other users of the sea				✓
Socio economics				
Direct employment opportunities (local, regional and national)	✓	✓	✓	
Direct Gross Value Added (GVA)	✓	✓	✓	
Supply chain impacts	✓	✓	✓	
Potential for inward investment	✓	✓	✓	
Impacts on existing tourism and recreational activities	✓			
Increased tourism / business interest		✓		
Seascape, landscape and visual				
Potential impacts on seascape and visual amenity during construction of the Pilot Park				✓
Potential seascape impacts due to presence of WTG Units				✓
Potential visual impacts due to the presence of the WTG Units		✓		
Construction impacts on landscape character and visual amenity	✓			
Impacts on landscape character and visual amenity during operation of onshore switchgear yard		✓		
Terrestrial ecology				
Disturbance or loss of important habitats and protected species at the onshore switchgear yard	✓			
Disturbance or loss of important habitats and protected species at the onshore switchgear yard				✓
Onshore archaeology and cultural heritage				
Potential direct disturbance to / damage of known and unknown assets of cultural and historical importance	✓			
Potential indirect disturbance to / damage of known and unknown assets of cultural and historical importance				✓

Potential impact	Scoped into EIA			Scoped out of EIA
	C/I	O/M	D	
Traffic and transport				
Disruption to local traffic flow	✓			
Alterations in volumes of traffic on local roads	✓			
Road traffic congestion associated with transport of offshore components of the Pilot Park				✓
Onshore noise				
Noise impacts at the cable landfall	✓			
Noise impacts during cable installation	✓			
Noise impacts at the onshore switchgear yard	✓			
Local air quality (onshore)				
Generation of dust during onshore construction				✓
Public space and amenity				
Disruption to use of public space and amenity during onshore construction				✓
Impacts on use of public space and amenity due to presence of onshore switchgear yard				✓

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24 GLOSSARY OF TERMS

Benthic communities	Species that live on the seabed
Cumulative effects	The overall effects of a number of different proposals of any other projects
Environmental Impact Assessment	Process to facilitate the identification and assessment of the potential environmental impacts associated with the development
Environmental Statement	A statutory document, containing the findings of the Environmental Impact Assessment, which is required as part of the consent and licence application processes
Export cable	Cable for transporting electricity from the Pilot Park to the landfall at Peterhead.
Export cable route corridor	Corridor within which the export cable from the Pilot Park will be located.
Historic Marine Protected Area	One type of Marine Protected Area, focusing on sites with marine historic assets of national importance within the Scottish territorial waters. The sites are being identified following the Marine and Coastal Access Act (2010)..
Hywind Demonstration (Hywind Demo)	SWL's full-scale prototype of the Hywind concept, installed outside Karmøy, Norway in 2009, and carrying a 2.3 MW Siemens Wind Turbine Generator (WTG).
Hywind Scotland Exclusivity Area (with Extension) (Exclusivity Area)	This is the offshore area of seabed awarded to SWL by The Crown Estate (TCE) under the terms of an Exclusivity Agreement for the deployment of floating wind turbines. The initial Exclusivity Area has since been extended by 1000 m in a northerly direction (along the northern edge). This extension is referred to as the 'with Extension' part of the Exclusivity Area
Hywind Scotland Pilot Park (Pilot Park)	Term that refers to the physical components of the Project that will be located within the proposed AfL area. This includes the five WTG Units and all associated infrastructure e.g. inter-array cables.
Hywind Scotland Pilot Park Project (the Project)	The entire pilot park project, including all onshore and offshore components of the project, and all project phases from project development to decommissioning..
Hywind Scotland Wind Turbine Generator Unit (WTG Unit)	The WTG Unit intended to be used for the Hywind Scotland Pilot Park Project, i.e. a 5 - 6 MW turbine with a purpose-designed Hywind floating support structure and mooring system. In temporary construction phases (prior to installation), or decommissioning phases, however, the phrase 'WTG Unit' is utilised to denote the system without the full mooring and export/array cable systems attached.
In combination effects	The effects of an activity or development in combination with other, different projects and activities
Inter-array cables	Cables that connect individual turbines within the Pilot Park to one another
Landfall	This is where the export cable will be brought ashore.
Landfall area of search	Area within which the landfall will be located
Marine Protected Area	Areas identified following the Marine and Coastal Access Act (2010) and Marine (Scotland) Act 2010 to meet the requirement to achieve a well-managed network of Marine Protected Areas in Scottish and UK waters.
Natura site	Sites designated under the EU Habitats and Birds Directives (e.g. SAC, SPA)

Onshore cable route corridor	Area within which the onshore cable route will be located
Onshore switchgear yard	The onshore yard that could include such items as; building(s)/enclosure(s), switchgear, control, communication and protection equipment, reactive compensation equipment (as necessary) and in the event of the Project involving installation of a 66 kV export cable, power transformer(s).
Onshore construction compound	Temporary enclosed working area for the storage of equipment, machinery, vehicles and temporary personnel facilities required during the onshore construction works.
Project Briefing Letter	A letter produced and sent to stakeholders prior to preparation of the Scoping Report to provide an introduction to the proposed development
Proposed Area for Agreement for Lease (proposed AfL Area)	SWL is in discussions with TCE for the granting of an Agreement for Lease for a revised area as shown on Figure 1.2. The northern and southern areas under the Agreement for Lease would be smaller than the Exclusivity Area apart from the northern edge which would be extended by 1,000 m in a northerly direction. The decision on which part of the proposed Agreement for Lease area will be developed (north or south) and the final location of the demonstration Hywind Scotland Pilot Park will be determined following surveys and on-going engineering and environmental studies
Rotor – Nacelle Assembly (RNA)	Part of an offshore wind turbine carried by the support structure.
Special Area of Conservation	Site designated under the EC Habitats Directive
Scottish Territorial Waters	Waters extending 12 nautical miles from Mean High Water Springs within which the Scottish Government has responsibility for marine planning.
Special Protection Area	Sites designated in accordance with Article 4 of the EC Birds Directive

25 ACRONYMS

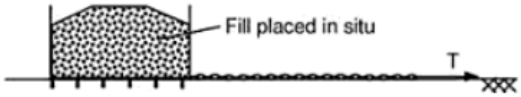
AfL	Agreement for Lease
AQMA	Air quality management areas
BIFA	Buchan Inshore Fishermen's Association
BODC	British Oceanographic Data Centre
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CIA	Cumulative and In-combination Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
COWRIE	Collaborative Offshore Wind Research into the Environment
CRM	Collision Rate Modelling
DECC	Department of Energy and Climate Change
DP	Decommissioning Programme
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
ESAS	European Seabirds at Sea
EU	European Union
FAME	Future of the Atlantic Marine Environment
GIS	Geographic Information System
HDD	Horizontally directionally drilled
HRA	Habitat Regulations Appraisal
HMPA	Historic Marine Protected Areas
ICES	International Council for Exploration of the Sea
JCP	Joint Cetacean Protocol
JNCC	Joint Nature Conservation Committee
MCA	Maritime and Coastguard Agency
MESH	Mapping European Seabed Habitats
MLWS	Mean Low Water Springs
MoD	Ministry of Defence
MHWS	Mean High Water Springs
MPA	Marine Protected Areas
MPS	Marine Policy Statement
MS	Marine Scotland
MS-LOT	Marine Scotland Licensing Operations Team
MSL	Mean Sea Level

MW	Mega Watt
NESBReC	North East Scotland Biological Records Centre
NRA	Navigational Risk Assessment
nm	Nautical miles
PHA	Preliminary (Navigational) Hazard Analysis
RNLI	Royal National Lifeboat Institute
PSA	Particle Size Analysis
RNA	Rotor-Nacelle Assembly
SAC	Special Area of Conservation
SAST	Seabirds at Sea Team
SEA	Strategic Environmental Assessment
SEPLA	Suction Embedded Plate Anchor, a combination of suction anchor and plate anchor.
SFF	Scottish Fishermen's Federation
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SSE	Scottish and Southern Energy
SWL	Statoil Wind Limited
TCE	The Crown Estate
WTG	Wind Turbine Generators
UKHO	United Kingdom Hydrographic Office

APPENDIX A HYWIND SCOTLAND – POTENTIAL ANCHOR ALTERNATIVES

Table A.1 Anchor alternatives

Anchor type	Image
Drag embedment anchor (Fluke anchor) > Well proven concept within the marine industry > Best suited for cohesive sediments, however, not too stiff since penetration difficulties can occur. > Easy installation, but could be time consuming. > Ideally fully submerged into the sea bed but in stiff clay and sandy seabed limited penetration is expected. > Not suitable for high side loads (especially if shallow penetration is expected) > Can easily be removed after end of use > Plough marks will appear after installation	
Torpedo anchor > Can be used at water depths above ~80m > Proven by North Sea installation > Requires soft soil conditions > Fast and efficient installation > Anchor becomes totally submerged into the sea bed > Very limited sea bed disturbance > May be used on Hywind if commercially attractive (indicated soil conditions don't allow for torpedo anchor in Maine or Scotland) > Can be difficult to remove	

Anchor type	Image
Suction anchor > A cylindrical steel can is forced into the sea bed by applying an under-pressure inside of the can > Well proven concept from the North Sea. > Not suitable in layered cohesionless material (sandy soil). > Time consuming installation method > Visible at the sea bed > Sea bed disturbance limited to anchor footprint > May be used for Hywind if other technical solutions are ruled out	
Gravity weight anchor > A casted concrete/steel reinforced anchor is placed at the sea bed > Alternatively an empty structure is place on seabed, which is then filled with heavy material. > Would probably be costly in terms of installation due to the anticipated size of such structure > Requires medium to hard soil conditions > May cause larger disturbances on the sea bed > Can easily be removed after use	Picture taken from Offshore Geotechnical Engineering by Mark Randolph et al. 

APPENDIX B STAKEHOLDER LIST

The table below lists stakeholders that have been identified for Hywind Scotland Pilot Park Project. This table shows which organisations were sent a copy of the Project Briefing Letter, which organisations have responded, which organisations SWL has had meetings with, or proposes to and those who will be notified of the publication of this Scoping Report.

Table B.1 Stakeholder list

Organisation	Sent a copy of the Project Briefing letter	Consultation status (as of September 2013)			To be notified of the publication of this Scoping Report
		Written response to Project Briefing letter	Meeting held	Further discussions proposed	
Aberdeen Airport	✓	×	×	✓	✓
Aberdeen and District Angling Association	✓	×	×	×	✓
Aberdeen Fish Producers Organisation	✓	×	×	×	✓
Aberdeen Harbour Trust	✓	×	×	×	✓
Aberdeen Renewable Energy Group	✓	×	×	×	✓
Aberdeenshire Council - Planning	✓	✓	✓	✓	✓
Archaeology Service for Aberdeenshire, Moray and Angus (part of Aberdeenshire Council)	✓	×	×	×	✓
ASCO Group	✓	×	×	×	✓
Association of Salmon Fishery Boards	✓	×	×	✓	✓
Atlantic Salmon Trust	✓	×	×	✓	✓
Bond Offshore	×	×	×	✓	✓
BP Forties Pipeline	×	×	×	×	×
Bristow Group	×	×	×	✓	✓
British Embassy, Oslo	×	×	×	×	×
BT (Decommissioned Telecom Cable Aberdeen - Bergen)	×	×	×	×	✓
BT Network Radio Protection	✓	×	×	×	✓
Buchan East Community Council	✓	×	×	×	✓
Buchan Inshore	✓	×	✓	✓	✓

Organisation	Sent a copy of the Project Briefing letter	Consultation status (as of September 2013)			To be notified of the publication of this Scoping Report
		Written response to Project Briefing letter	Meeting held	Further discussions proposed	
Fishermen's Association (BIFA)					
Civil Aviation Authority - Safety Regulations	✓	×	×	×	✓
Civil Aviation Authority (CAA)	✓	×	×	×	✓
Cruising Association	✓	×	×	×	✓
DECC	×	×	×	×	✓
Defence Estates (MoD)	✓	×	×	✓	✓
Friends of the Earth, Scotland	✓	×	×	×	✓
Greenpeace	✓	×	×	×	✓
Hebridean Whale and Dolphin Trust	✓	×	×	×	✓
Highlands and Islands Airports (HIA)	✓	✓	×	×	×
Highlands and Islands Enterprise (HIE)	✓	×	×	×	✓
Historic Scotland	✓	✓	×	×	✓
Joint Nature Conservation Committee (JNCC)	✓	×	✓	✓	✓
Marine Conservation Society (MCS)	✓	×	×	×	✓
Marine Management Organisation (MMO)	✓	×	×	×	✓
Marine Safety Forum	×	×	×	×	✓
Marine Scotland - LOT	✓	✓	✓	✓	✓
Marine Scotland Compliance	✓	×	×	×	✓
Maritime and Coastguard Agency (MCA) - HM Coastguard Aberdeen	✓	×	×	×	✓
Maritime and Coastguard Agency (MCA) - Navigation	✓	×	✓	✓	✓
Minister for Energy, Enterprise and Tourism	×	×	×	×	✓
Moray Firth Inshore	✓	×	×	✓	✓

Organisation	Sent a copy of the Project Briefing letter	Consultation status (as of September 2013)			To be notified of the publication of this Scoping Report
		Written response to Project Briefing letter	Meeting held	Further discussions proposed	
Fisheries Group					
Moray Firth Partnership	✓	×	×	×	✓
MSP for Banff and Buchan (Peterhead)	×	×	×	×	✓
National Grid	×	×	×	×	✓
NATS En Route Ltd (NERL)	✓	×	✓	✓	✓
Network Rail	×	×	×	×	✓
North East of Scotland Fishermen's Organisation	✓	×	×	✓	✓
North Link Ferries	✓	×	×	×	✓
Northern Lighthouse Board (NLB)	✓	✓	✓	✓	✓
Oil and Gas UK	✓	×	×	×	✓
Peterhead Port Authority	✓	×	✓	×	✓
Royal National Lifeboat Institution (RNLI)	✓	×	×	✓	✓
Royal Society for the Protection of Birds (RSPB)	✓	✓	×	×	✓
Royal Yachting Association (RYA) Scotland	✓	✓	✓	✓	✓
Scottish and Southern Energy (SSE) Grid Owner	×	×	×	×	✓
Scottish Boating Alliance	✓	✓	×	×	×
Scottish Canoe Association	✓	×	×	×	×
Scottish Coastal Forum	✓	×	×	×	✓
Scottish Enterprise	✓	×	×	×	✓
Scottish Environment Protection Agency (SEPA)	✓	✓	×	×	✓
Scottish Federation of Sea Anglers	✓	×	×	✓	✓
Scottish First Minister	×	×	×	×	×
Scottish Fishermen	✓	×	✓	✓	✓

Organisation	Sent a copy of the Project Briefing letter	Consultation status (as of September 2013)			To be notified of the publication of this Scoping Report
		Written response to Project Briefing letter	Meeting held	Further discussions proposed	
Federation					
Scottish Fishermen's Organisation	✓	×	×	×	✓
Scottish Government Energy Division	×	×	×	×	×
Scottish Hydro Electric Transmission Ltd (SHETL)	×	×	×	×	×
Scottish Natural Heritage	✓	✓	✓	✓	✓
Scottish Surfing Federation	✓	×	×	×	✓
Scottish White Fish Producer's Association	✓	×	×	×	✓
Sea Mammal Research Unit (SMRU)	×	×	×	×	✓
SSE Grid Owner	×	×	×	×	✓
Subsea Cables UK	✓	×	×	×	✓
Surfers Against Sewage (SAS)	✓	×	×	×	✓
The Crown Estate	×	×	✓	×	✓
The East Grampian Coastal Partnership	✓	×	×	×	✓
The National Trust for Scotland	✓	×	×	×	✓
Transport Scotland	✓	×	×	×	✓
Ugie Smokehouse	✓	×	×	×	✓
UK Chamber of Shipping	✓	×	×	×	✓
UK Hydrographic Office	×	×	×	×	✓
Visit Scotland	✓	×	×	×	✓
Whale and Dolphin Conservation Society (WDCS)	✓	✓	✓	×	✓
World Wide Fund for Nature (WWF)	✓	×	×	×	✓

APPENDIX C PRELIMINARY HAZARD ANALYSIS

Shipping and Navigation Preliminary Hazard Analysis

Hywind Scotland Pilot Park Project

(Technical Note)

Prepared by:	Anatec Limited
Presented to:	Xodus on behalf of Statoil
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TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 BACKGROUND 1
1.2 OBJECTIVES 1
1.3 ABBREVIATIONS 2
2. DESCRIPTION OF PROJECT 3
2.1 PILOT PARK 3
2.2 INSTALLATION 5
3. NAVIGATIONAL FEATURES 7
4. BASELINE VESSEL ACTIVITY ANALYSIS 9
4.1 AIS SHIPPING ANALYSIS 9
4.2 FISHING VESSEL ACTIVITY 15
4.3 SATELLITE DATA ANALYSIS 20
4.4 RECREATIONAL VESSEL ACTIVITY 23
5. REVIEW OF HISTORICAL MARITIME INCIDENTS 25
5.1 INTRODUCTION 25
5.2 MAIB 25
5.3 RNLI 28
6. STAKEHOLDER CONSULTATION 29
6.1 INTRODUCTION 29
6.2 MARITIME AND COASTGUARD AGENCY (MCA) 29
6.3 NORTHERN LIGHTHOUSE BOARD (NLB) 29
6.4 ROYAL YACHTING ASSOCIATION (RYA) 30
6.5 PETERHEAD PORT AUTHORITY (PPA) 30
6.6 OTHER STAKEHOLDERS 31
7. PRELIMINARY HAZARD ANALYSIS 32
7.1 INTRODUCTION 32
7.2 OVERVIEW OF VESSEL EXPOSURE 32
7.3 HAZARD REVIEW 33
7.4 ASSEMBLY AND TOW 34
7.5 MITIGATION MEASURES 34
8. PROPOSED METHODOLOGY – NAVIGATION RISK ASSESSMENT 35
9. REFERENCES 37

1. Introduction

1.1 Background

Anatec were commissioned by Xodus Group Ltd on behalf of Statoil to carry out a Preliminary Hazard Analysis (PHA) of the proposed Hywind Scotland Pilot Park Project in Buchan Deep off Peterhead.

The location of the Hywind Scotland Exclusivity Area awarded by The Crown Estate (TCE) and the proposed Agreement for Lease (AfL) area are illustrated in Figure 1.1. In addition to the Pilot Park, there will also be a requirement for an inshore assembly sitewhere the WTG Units will be assembled. Fully assembled WTG Units will then be towed from the assembly site to the proposed AfL Area. Navigational issues associated with this aspect of the project will also need to be considered.

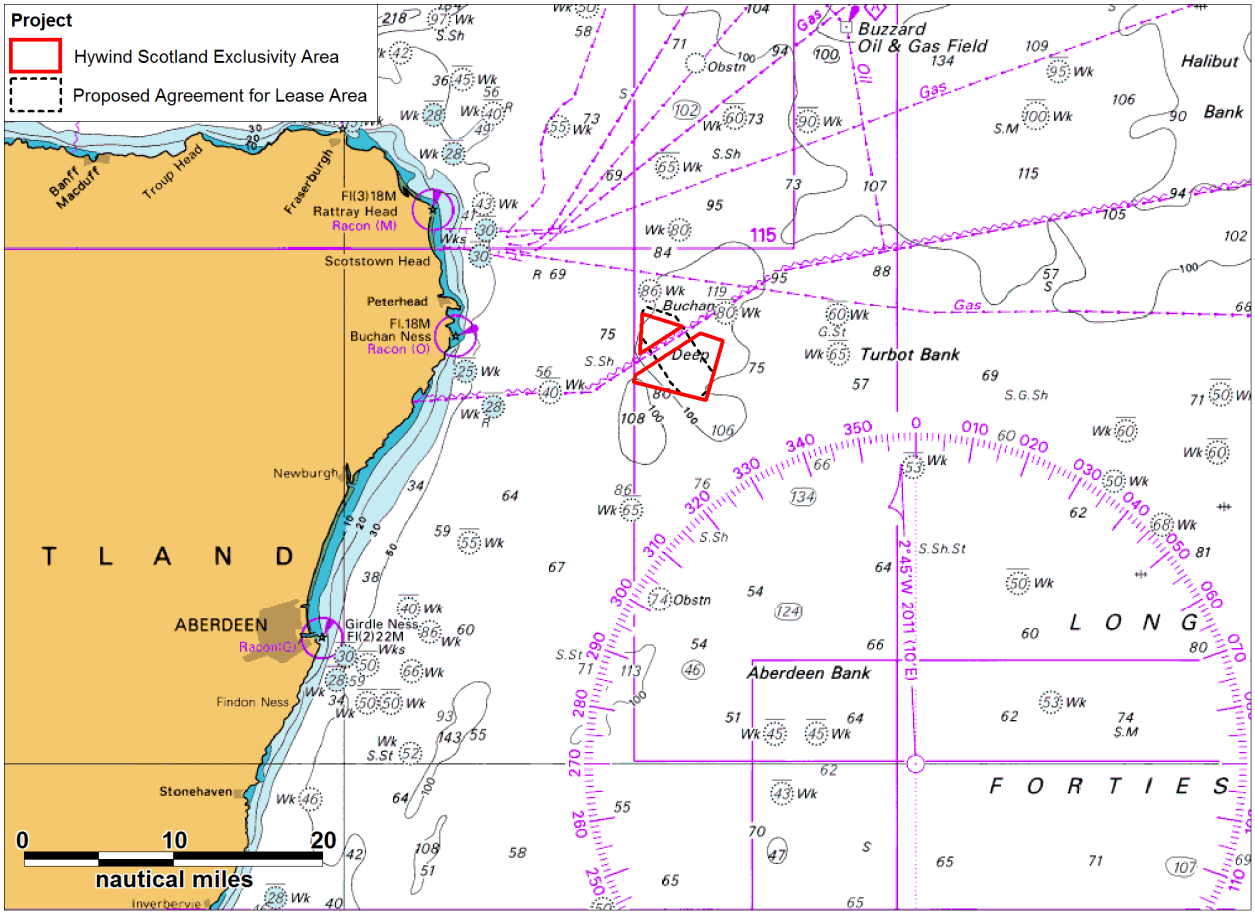

Figure 1.1 Location of the Hywind Scotland Pilot Park Project

1.2 Objectives

The objectives of the work were as follows:

- Identify the navigational features of the area
- Review the shipping, fishing and recreational vessel activity
- Review historical maritime incidents
- Carry out initial consultation with key stakeholders
- Perform a preliminary hazard review
- Outline a methodology and scope of work for the Navigation Risk Assessment (NRA)

1.3 Abbreviations

The following abbreviations are used in this report.

AfL	-	Agreement for Lease
AIS	-	Automatic Identification System
ALARP	-	As Low As Reasonably Practicable
ATBA	-	Area To Be Avoided
CAA	-	Civil Aviation Authority
DECC	-	Department of Energy and Climate Change
DfT	-	Department for Transport
GRT	-	Gross Registered Tonnes
IALA	-	International Association of Lighthouse Authorities
ICES	-	International Council for the Exploration of the Seas
MAIB	-	Marine Accident Investigation Branch
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MMO	-	Marine Management Organisation
nm	-	Nautical Mile (1,852 metres)
NLB	-	Northern Lighthouse Board
NRA	-	Navigation Risk Assessment
PHA	-	Preliminary Hazard Analysis
PLN	-	Port Letter Number
RNLI	-	Royal National Lifeboat Institution
RYA	-	Royal Yachting Association
SEPLA	-	Suction Embedded Plate Anchor
SFF	-	Scottish Fishermen's Federation
UKHO	-	United Kingdom Hydrographic Office
VMS	-	Vessel Monitoring Services
WTG	-	Wind Turbine Generator

2. Description of Project

2.1 Pilot Park

The proposed Project is a demonstration floating offshore wind farm with planned capacity of up to 30 MW.

Statoil has been awarded an Exclusively Agreement from The Crown Estate (TCE) for the deployment of floating WTG Units in an area of deep water (95-120 m) within the Buchan Deep, offshore from Peterhead in the north east of Scotland, just beyond the 12 nautical miles territorial limit.

Statoil are currently in the process of identifying an area based on the Exclusivity Area that will form the basis of their application to the TCE for an Agreement for Lease (AfL). One of the options under consideration as the proposed AfL Area is illustrated in Figure 2.1.

For the purpose of this PHA, reference is made to the Exclusivity Area rather than the proposed AfL Area because the proposed AfL Area was only identified once the analysis of the AIS data had been completed. However, this does not significantly affect the findings of the AIS analysis in terms of number of intersections, etc. as presented in this report.

The total area of the Hywind Scotland Exclusivity Area is approximately 61.43 km^2, while the proposed AfL Area takes up approximately 53.52$km^{2.}$

(Please note the green, yellow and red lines shown off Peterhead Port are printed on the Admiralty Chart. This is the case with all figures using this scale of chart.)

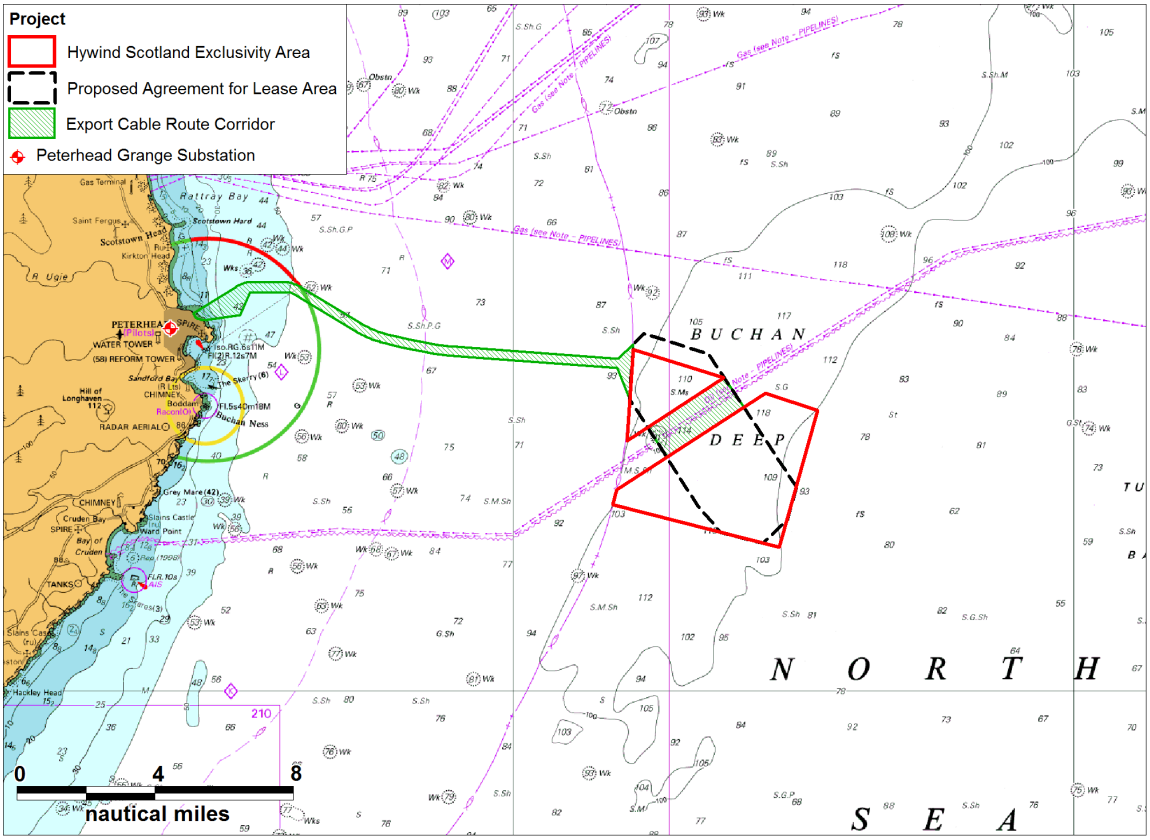

Figure 2.1 Chart Overview of Hywind Scotland Pilot Park Project Area

It can be seen that the Hywind Scotland Exclusivity Area is split into northern and southern sections by the Forties to Cruden Bay pipeline passing through the zone. The Pilot Park will either be located to the north or south of the pipelines. The final location of the Wind Turbine Generator (WTG) Units will be determined following surveys and environmental and engineering studies; however the final footprint of the Pilot Park is expected to only be approximately 17.5 km^2, including the mooring system.

The Hywind Scotland Pilot Park will consist of 5 turbines, 5-6 MW each, attached to the seabed by a three-point mooring spread. The anchor type will depend on the seabed conditions, but four types are currently being considered: torpedo anchors, suction anchors, weight anchors, SEPLA and fluke anchors. Some anchors could be shared between two or more turbines. The WTG Units will be located between 720 m and 1,600 m apart and mooring lines' radius extending out from the turbines will be approximately 600-1200 m. WTG Unit moorings and layout is presented in Figure 2.2.

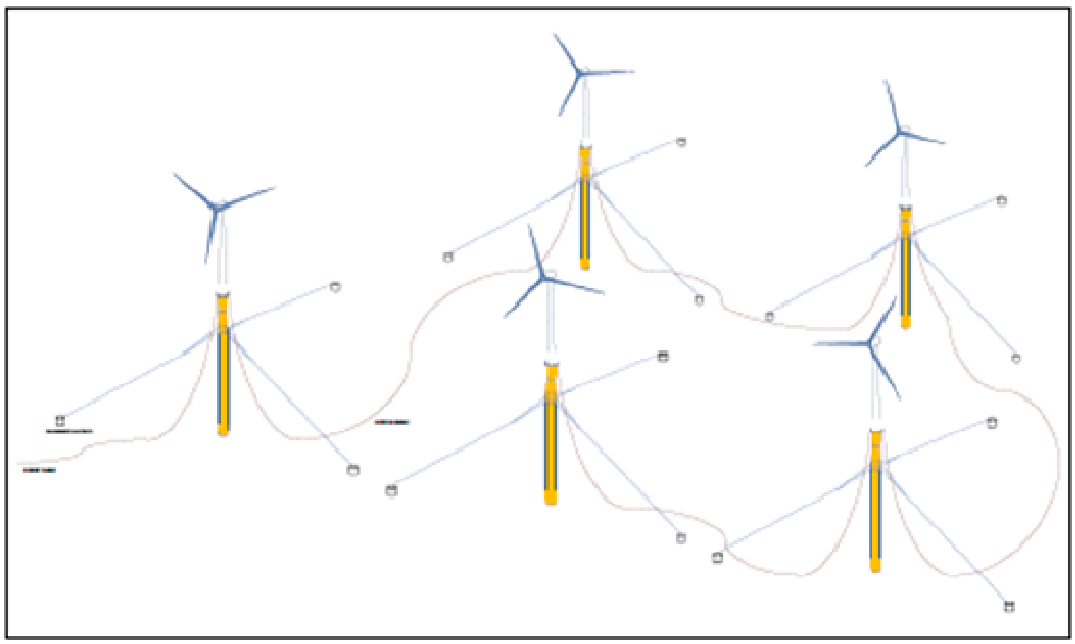

Figure 2.2 WTG Unit Moorings and Layout

With reference to earlier mooring analysis it is noted that the WTG Units can move around 50-60 m laterally. However, a precise radius will be determined following finalisation of the mooring system design. By design, one or two anchors will be sufficient to hold the WTG Unit on station.

2.2 Installation

Hywind substructures will be fabricated at existing facilities and either stored or temporarily moored at a suitable location.

The Rotor-Nacelle Assembly (RNAs) will be manufactured and stored at the RNA vendor's manufacturing facilities. After delivery they will be stored at the staging site or temporarily moored at a suitable location until assembly of the WTG Units.

After assembly and inshore commissioning the WTG Units will be towed to the Peterhead coastal area for deployment. If the chosen assembly site is located on the west coast of Scotland the WTG Units will be towed to the Pilot Park around the north coast of Scotland (passing to the North of Orkney).

The towing operation will be performed with 2 – 4 vessels, possibly varying the towing spread along the route by adding or removing assisting tugs.

Whilst inshore the five WTG Unit substructures will be upended with sea-water and ballast, this will require a minimum water-depth of 75-85m, before being towed to the Pilot Park.

The mooring system will be pre-installed prior to cable installation and deployment of the WTG Units. The installation method will be dependent on the selected anchor type, but will for any type result in the anchor being installed on/under the seabed with a part of the chain lying on the seafloor with a retrieval system. A buoy floating on the surface or approximately 10 m above the seabed will most likely be installed as part of the retrieval system.

After arrival at the offshore site the WTG Units will be connected to the mooring system. Two to three vessels will likely be involved in the mooring operation.

A cable installation vessel will be used for the export and inter-array cables. The export cable will most likely be installed from the landfall in Peterhead to the Pilot Park with the end wet-stored on the seabed. The installation will take place before the mooring of the WTG Units. The static parts of the cable will be buried to at least 1 m depth using a cable lay vessel. The final method of cable installation will depend on seabed conditions along the export cable route.

The inter-array cables will hang-off the turbines and lie on the seabed. The installation of inter-array cables can take place either before or after the mooring of the WTG Units.

3. Navigational Features

Figure 3.1 presents the location of the Hywind Scotland Exclusivity Area and proposed AfL Area relative to the main navigational features of the area. As the inshore assembly site is yet to be determined and therefore the tow route of the assembled WTG Units to the Pilot Park unknown, it has not been possible to define the navigational features of these areas in the PHA. Consideration of navigational features in these areas will however be considered as and when such details are available.

The Exclusivity Area is located mainly within Buchan Deep, which is an area of deeper water (>100 m) situated approximately 12.3 nautical miles east off Buchan Ness on the north east coast of Scotland.

The Forties Pipeline System crosses the Exclusivity Area running roughly NE-SW between the Forties Oil Field and Port Errol at Cruden Bay.

There are a number of military practice areas in the vicinity. The Drums Links firing range and Black Dog rifle range are located along the coast near to Aberdeen. Red flags and occasionally red lights are displayed from flagstaffs on the shore when firing takes place. A managed defence area used by the RAF is 7.5 nm to the south of the study area at its nearest point.

The agreement for lease area for the proposed European Offshore Wind Deployment Centre (EOWDC), situated in Aberdeen Bay, is located approximately 20.2 nm SW of the Exclusivity Area. The total area of the EOWDC boundary is approximately 5.8 nm^2 (20 km^2). It is planned to consist of 11 turbines.

The closest offshore installation is within the Buzzard oil field operated by Nexen Petroleum at a distance of 22.3 nm northeast of the Hywind Scotland Exclusivity Area.

The nearest port is located at Peterhead approximately 12.5 nm to the west. Peterhead Harbour is one of the principal fishing harbours in Scotland and also handles commercial vessels. Peterhead Bay Harbour contains a supply base for the North Sea oil and gas industry, and a tanker jetty for the import of fuel oil for Peterhead power station. The port can handle bulk, general cargoes and cruise ships. Pilotage is compulsory within Peterhead Bay Harbour for all oil tankers carrying oil tankers carrying oil in bulk as cargo and all vessels exceeding 3500 GRT, carrying more than 1 tonne of IMO Class I explosives and hazardous cargoes or dangerous goods in bulk. The port also has a marina for pleasure craft.

Aberdeen Harbour is located to the SW, with the Harbour Limits 27.2 nm from the study area. It is the principal commercial port serving the northeast of Scotland with approximately 7,500 ship arrivals in 2010 handling approximately 4.7 million tonnes of imports and exports. The Port is the main marine support centre for the North Sea oil and gas industry. 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. The Port also has a large fish market.

There is a designated anchorage area to the north of the Aberdeen Harbour limits, which was established in 2010.

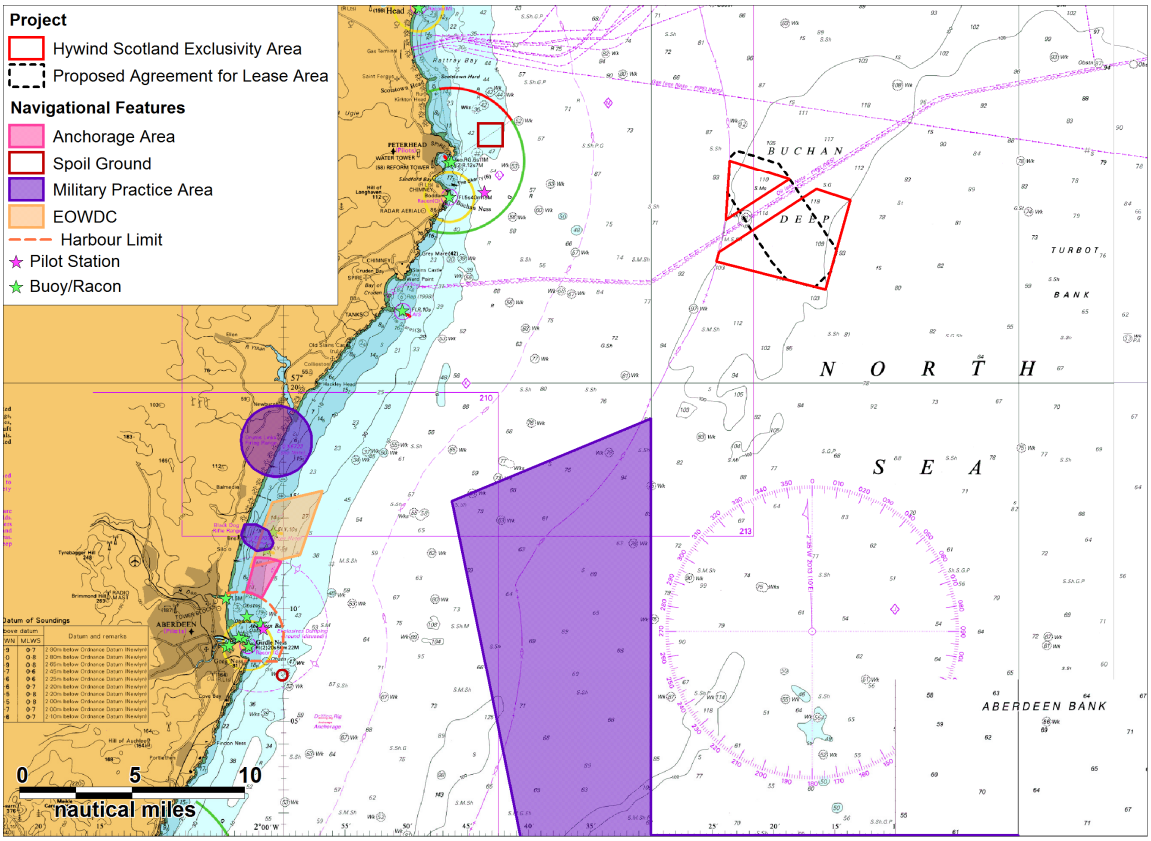

Figure 3.1 Navigational Features in proximity to the Hywind Scotland Exclusivity Area and proposed AfL Area

4. Baseline Vessel Activity Analysis

4.1 AIS Shipping Analysis

This section presents AIS data within 10nm of the Hywind Exclusivity Area[1] for a 28 day period in 2012/2013 (14 days in August 2012 and 14 days in January 2013).

AIS is carried by the vast majority of commercial ships operating in UK Waters including all ships of 300 GT and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages, passenger ships irrespective of size built on or after 1 July 2002 and fishing vessels of 24m length and over (at the time of the survey). A proportion of smaller vessels, including fishing vessels and leisure craft, also carry AIS voluntarily.

A plot of all the tracks recorded within the Hywind Scotland Exclusivity Area buffered by 10nm, colour-coded by vessel type broadcast on AIS, is presented in Figure 4.1.

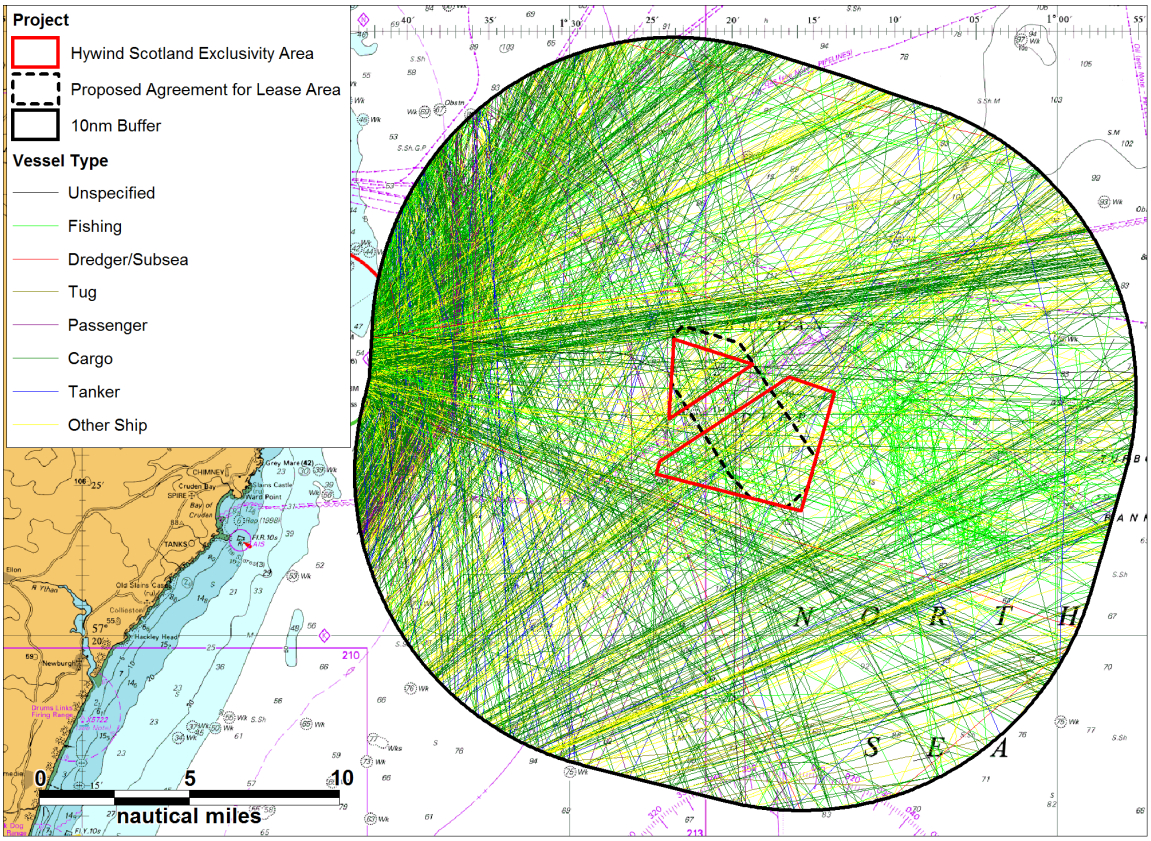

Figure 4.1 AIS Ship Tracks recorded during Survey

[1] The area was revised slightly with the identification of the proposed AfL Area during the course of the study but this does not significantly affect the findings of the AIS analysis in terms of number of intersections, etc.

An average of 48 unique vessels per day were tracked within 10nm of the Hywind Scotland Exclusivity Area. Of these, eight ships per day on average passed through the Exclusivity Area. The busiest day was 27th August 2012 when 13 ships were recorded intersecting the Exclusivity Area.

In terms of seasonal variations, there were higher numbers of vessels transiting within 10 nm of the site in summer compared to winter (58 versus 39 per day). Nine vessels were recorded passing through the Hywind Scotland Exclusivity Area in the summer compared to six vessels in winter.

An analysis of the AIS ship types recorded passing through the Exclusivity Area (excluding 1.6% unspecified) during the survey period is presented below.

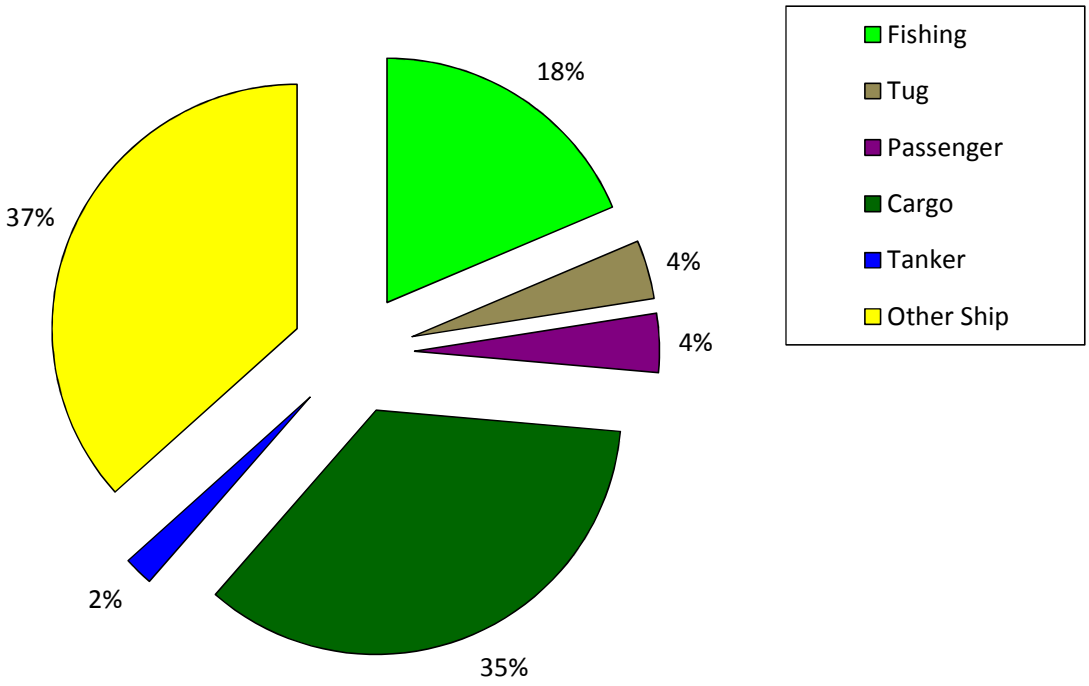

Figure 4.2 Vessel Types identified passing within the Exclusivity Area

The majority of tracks transiting the Exclusivity Area were made by 'other' vessels (37%) and cargo vessels (35%). The 'other' ships were mainly offshore industry vessels (e.g., ERRV, supply and dive support vessels) supporting oil & gas operations in the North Sea from bases in Peterhead and Aberdeen.

The AIS tracks colour-coded by ship length and draught (where broadcast) are presented in Figure 4.3 and Figure 4.4, respectively.

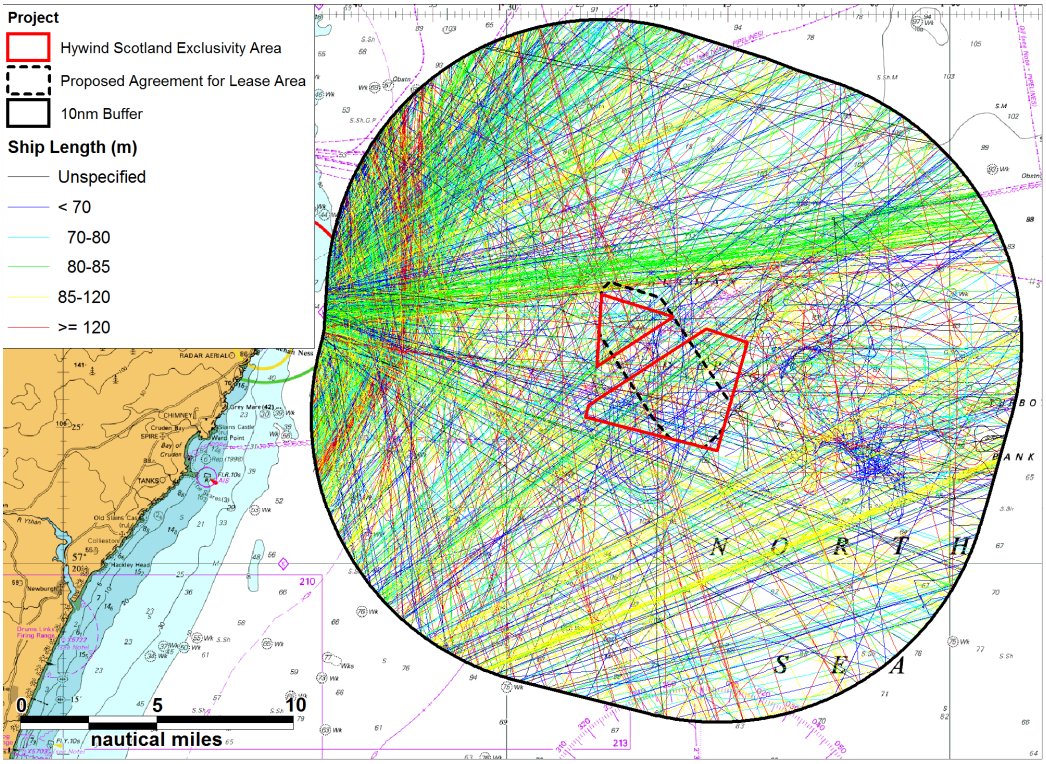

Figure 4.3 Ship Length

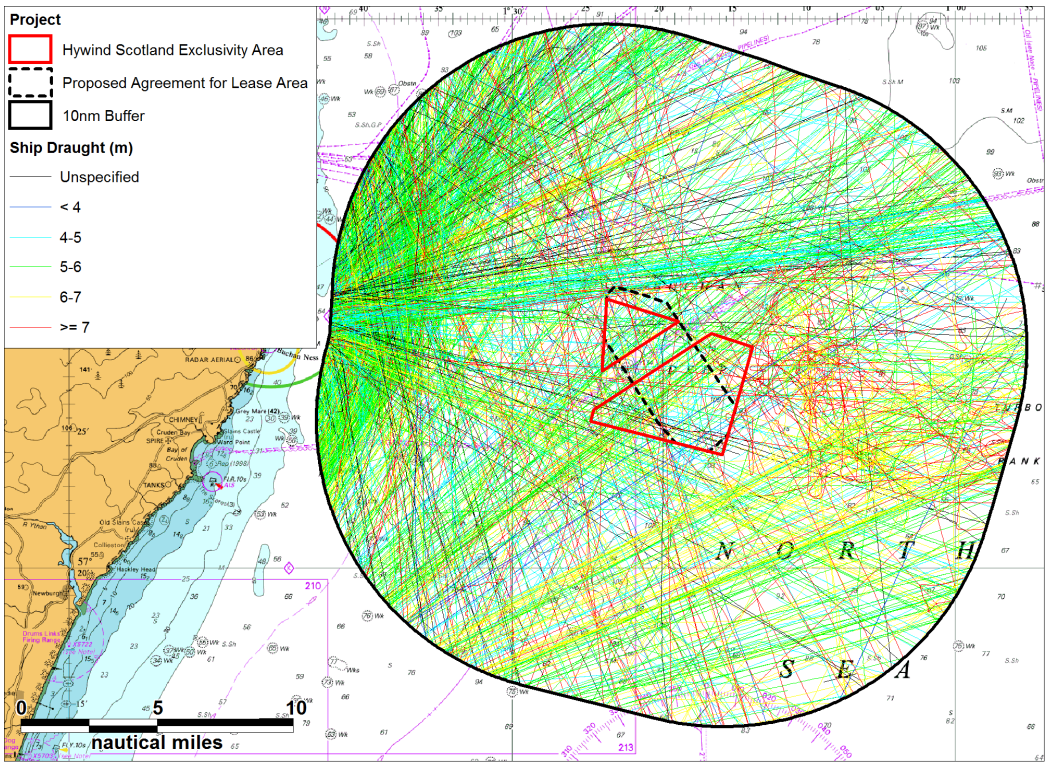

Figure 4.4 Ship Draught

The median length of vessels passing within the 10 nm buffer of the Exclusivity Area was 82m. The median length of vessels intersecting the Hywind Scotland Exclusivity Area was 81 m. The longest vessel recorded both within the 10 nm buffer and the Hywind Scotland Exclusivity Area was the pipelay vessel *Solitaire* at 300 m.

The median draught of vessels passing within 10nm of the Exclusivity Area was 5 m. The vessels with the deepest draughts were the bulk carrier *Yeoman Bontrup* and the piplay vessel *Solitaire*, both 14m. The median draught of vessels intersecting the Hywind Scotland Exclusivity Area was also 5 m with the *Solitaire* being the deepest draught.

The deadweight tonnages (DWT) of ships recorded during the survey have been researched. A plot of the tracks colour-coded by DWT is presented in Figure 4.5.

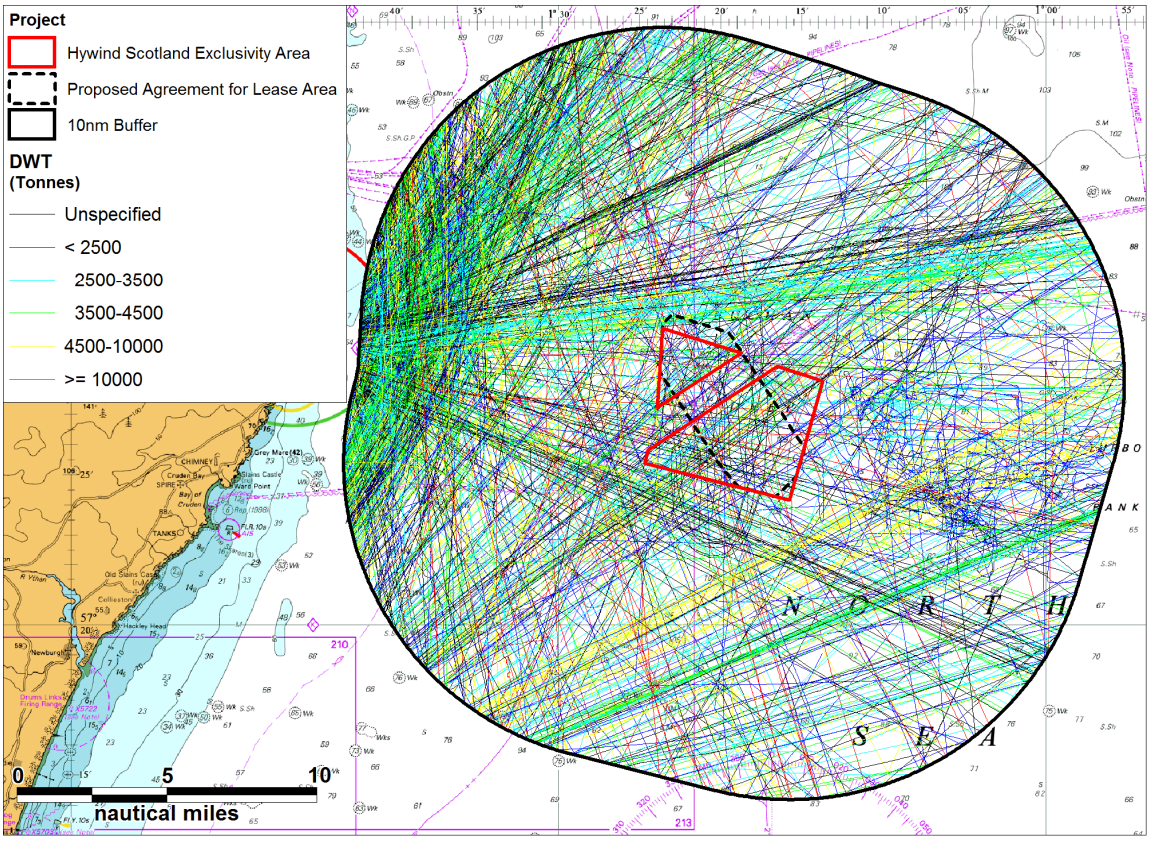

Figure 4.5 Ship Deadweight Tonnage

The median DWT of vessels recorded within the 10nm buffer was 3,298 tonnes (excluding 25% unspecified), with the largest ship being the bulk carrier *Cape Shanghai* at 174,109 tonnes. The median DWT of vessels intersecting the Hywind Scotland Exclusivity Area was 3,200 tonnes. The largest ship recorded crossing the Exclusivity Area was the pipe layer *Solitaire* at 127,435 tonnes.

The tracks colour-coded by average course are presented in Figure 4.6.

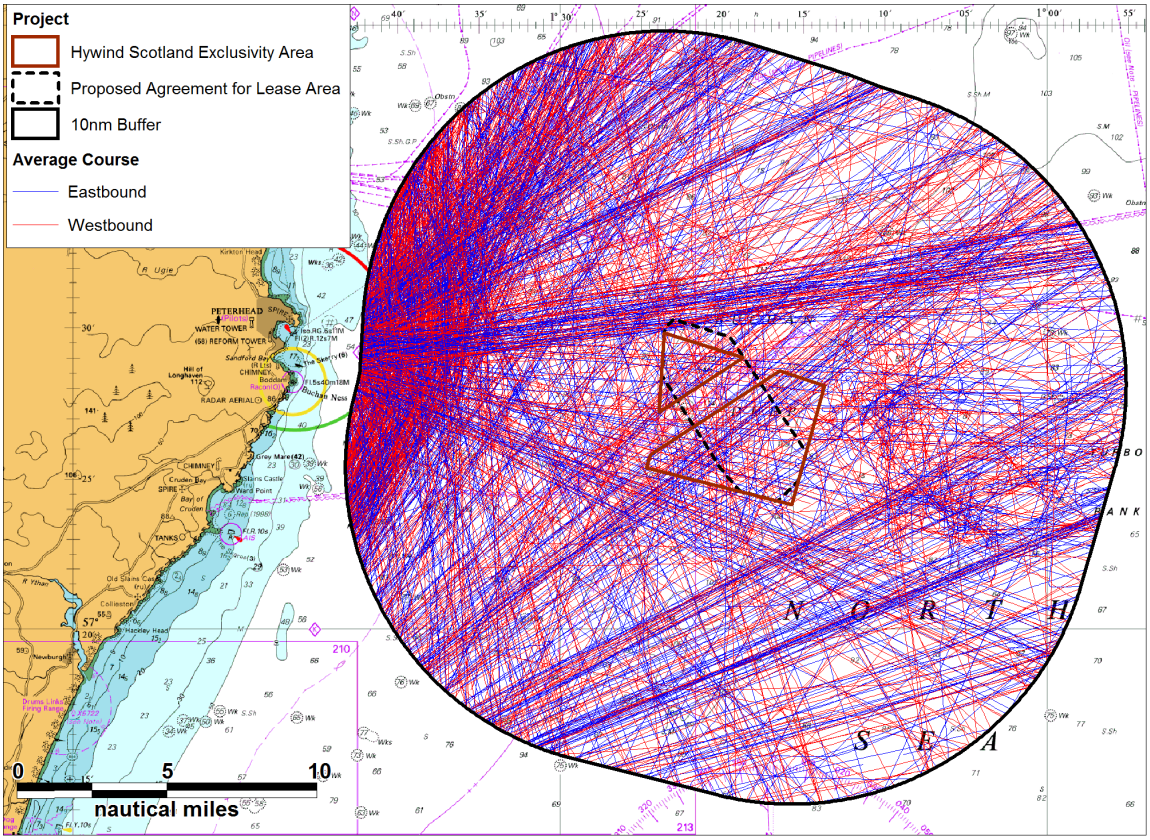

Figure 4.6 AIS Tracks by Average Course

Overall, 48% of vessels were headed generally eastbound and 52% westbound. Vessels headed westbound were most likely to be inbound to the ports of Aberdeen and Peterhead and vice versa. There are no traffic separation schemes or recommended routes in the vicinity of the Exclusivity Area.

The speed distribution is summarised in Figure 4.7. The median speed of vessels transiting the Hywind Scotland Exclusivity Area was 9.8 knots. The fastest vessel was the passenger cruise ship *Caribbean Princess* travelling at 20.1 knots bound for Invergordon.

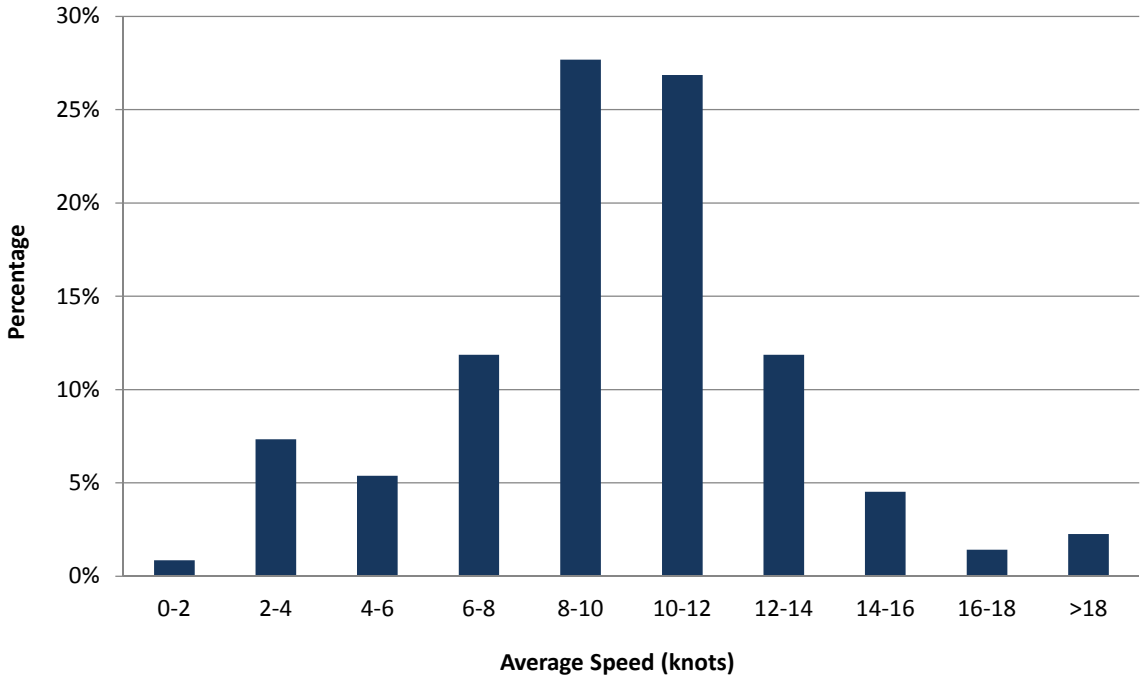

Figure 4.7 Average Speed of Vessels passing within the Exclusivity Area

From the AIS data, the main destinations of vessels intersecting the Exclusivity Area are presented in Figure 4.8.

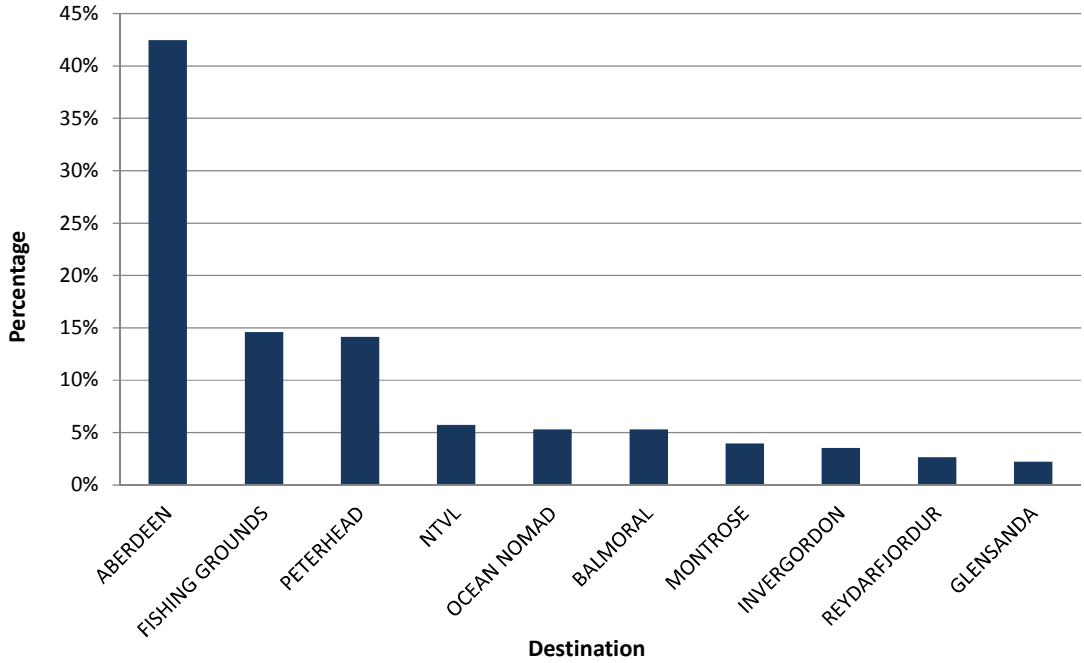

Figure 4.8 Destinations of Vessels crossing the Exclusivity Area

The most common destinations were the NE Scotland ports of Aberdeen and Peterhead, fishing grounds and oil and gas fields in the North Sea such as Balmoral. NTVL (Figure 4.8) is a drilling rig which was working in the Central North Sea during the survey. Other frequently recorded destinations included smaller ports in north east of Scotland, such as Montrose and Invergordon. The most frequently recorded international destination was Reydarfjordur in Iceland.

A plot of relative ship density is presented in Figure 4.9. This illustrates that most of the Exclusivity Area has moderate shipping traffic levels relative to the wider 10nm buffer area. High levels of traffic towards the west of the Exclusivity Area are associated with the traffic headed to/ from busy ports such as Aberdeen and Peterhead and traffic passing up and down the east coast of the UK.

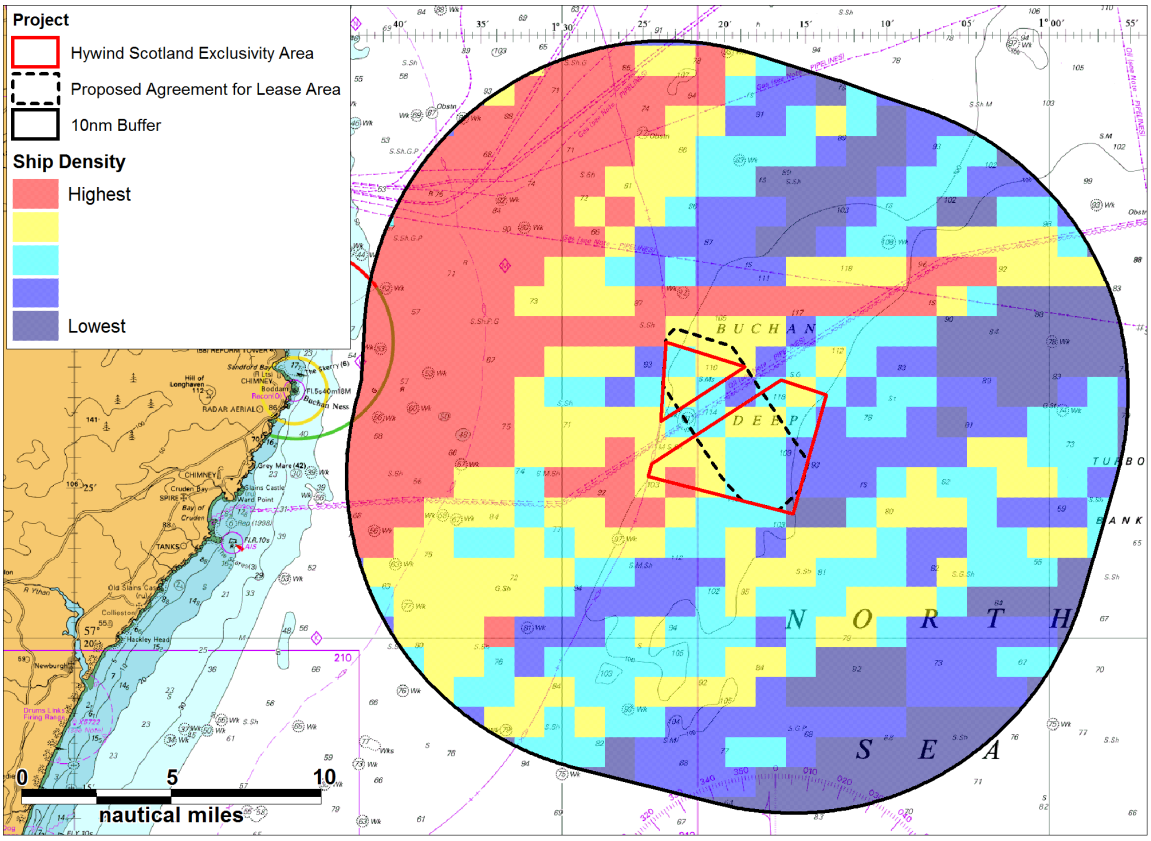

Figure 4.9 Ship Density within 10nm of the Study Area

4.2 Fishing Vessel Activity

At the time of the survey, AIS carriage was mandatory for larger fishing vessels ≥ 24m length under EU Directive. A proportion of smaller fishing vessels also carry AIS voluntarily but may not broadcast continuously. This section reviews the latest available sightings data (presented in Section 4.2.2) and satellite data (VMS records presented in Section 4.3) for the Exclusivity Area.

4.2.1 Surveillance Data - Geographical Division

Fisheries statistics in the UK are reported by ICES statistical Rectangles and Subsquares. The proposed Hywind Scotland Exclusivity Area and proposed AfL Area are located within ICES Rectangles 43E8 and 44E8, and more specifically Subsquares 43E8/2 and 44E8/4, as shown in Figure 4.10. The average Subsquare area is approximately 242 nm^2 (833 km^2).

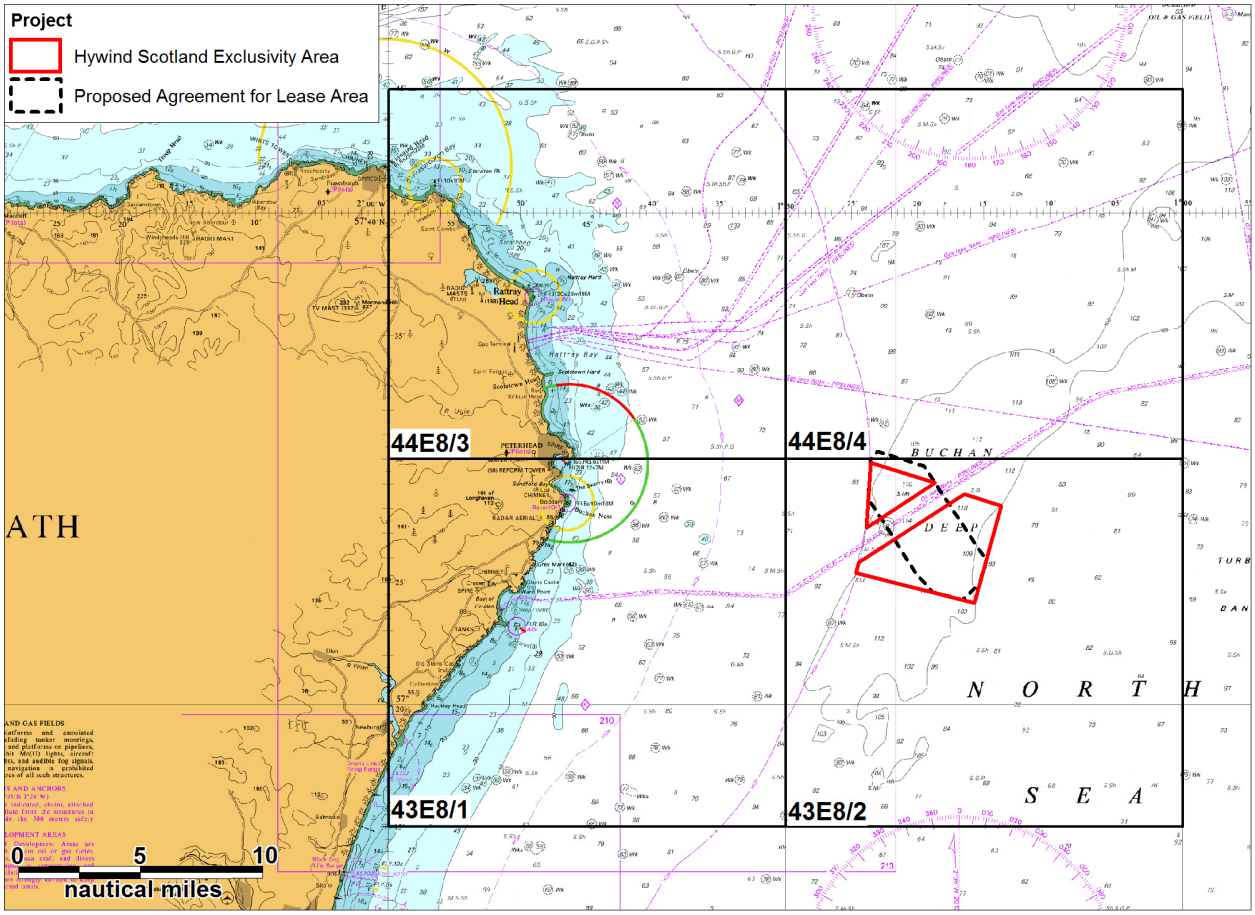

Figure 4.10 ICES Subsquares encompassing proposed Exclusivity Area

4.2.2 Sightings Data

Data on fishing vessel sightings were obtained from Marine Scotland Compliance who monitor the fishing industry in Scottish waters through the deployment of patrol vessels and surveillance aircraft.

Each patrol logs the positions and details of fishing vessels within the Rectangle being patrolled. All vessels are logged, irrespective of size, provided they can be identified by their Port Letter Number (PLN).

The sightings data from four years (2008-2012) were imported into a GIS for mapping and analysis. The fishing vessel sightings colour-coded by nationality are presented in Figure 4.11.

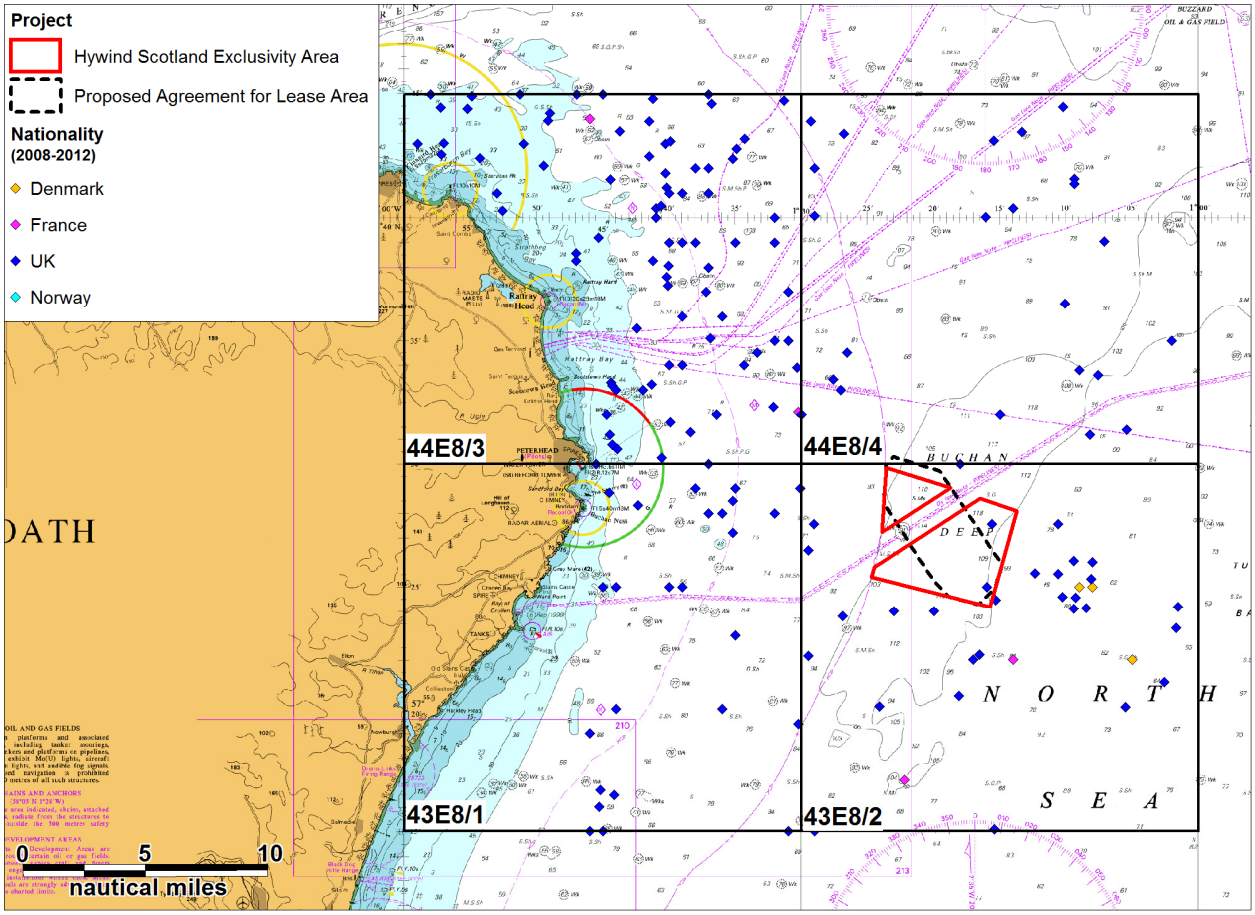

Figure 4.11 Fishing Vessel Sightings by Nationality (2008–12)

It can be seen that the majority of fishing vessels were registered in the UK (95.5%). Two sightings were recorded within the Exclusivity Area boundary; both were UK-registered.

The fishing vessel sightings colour-coded by gear type are presented in Figure 4.12 and summarised in Figure 4.13. The main fishing method overall was demersal trawling, accounting for approximately 70% of activity. There were two vessels sighted within the Hywind Scotland Exclusivity Area: a demersal trawler and a pair trawler.

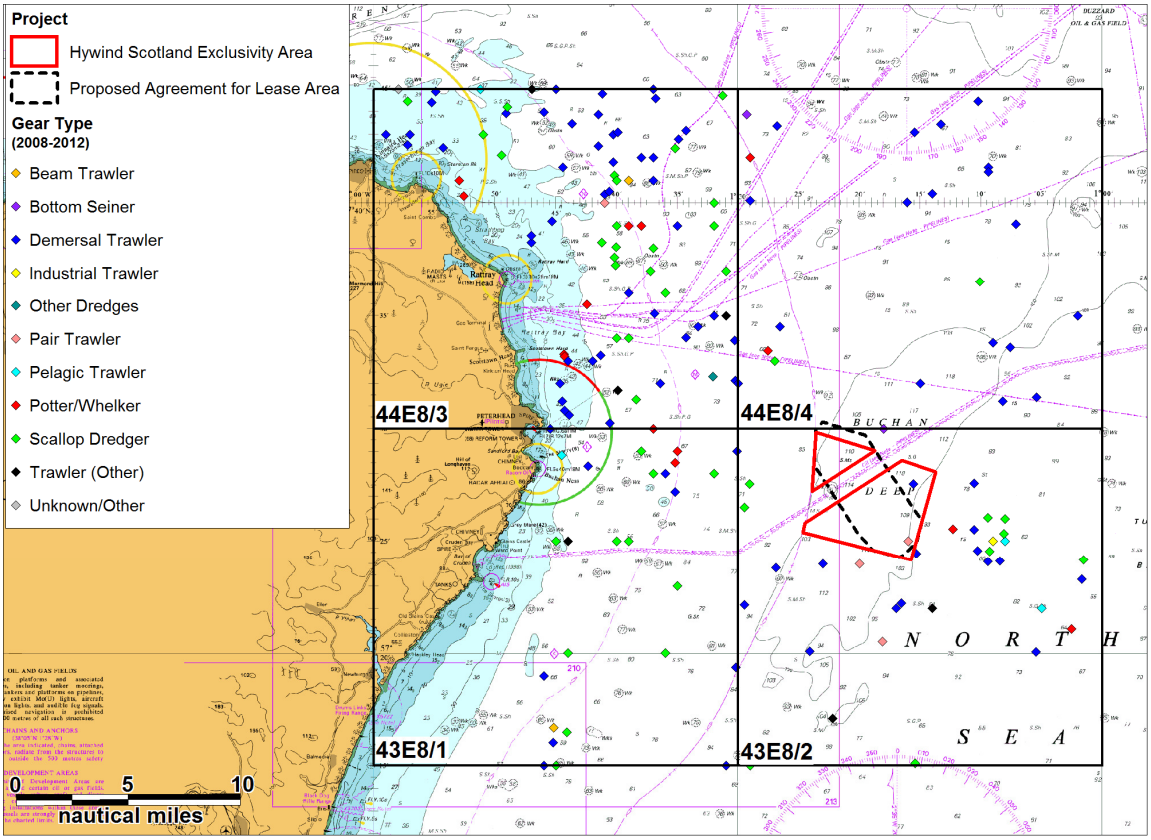

Figure 4.12 Fishing Vessel Sightings by Gear Type

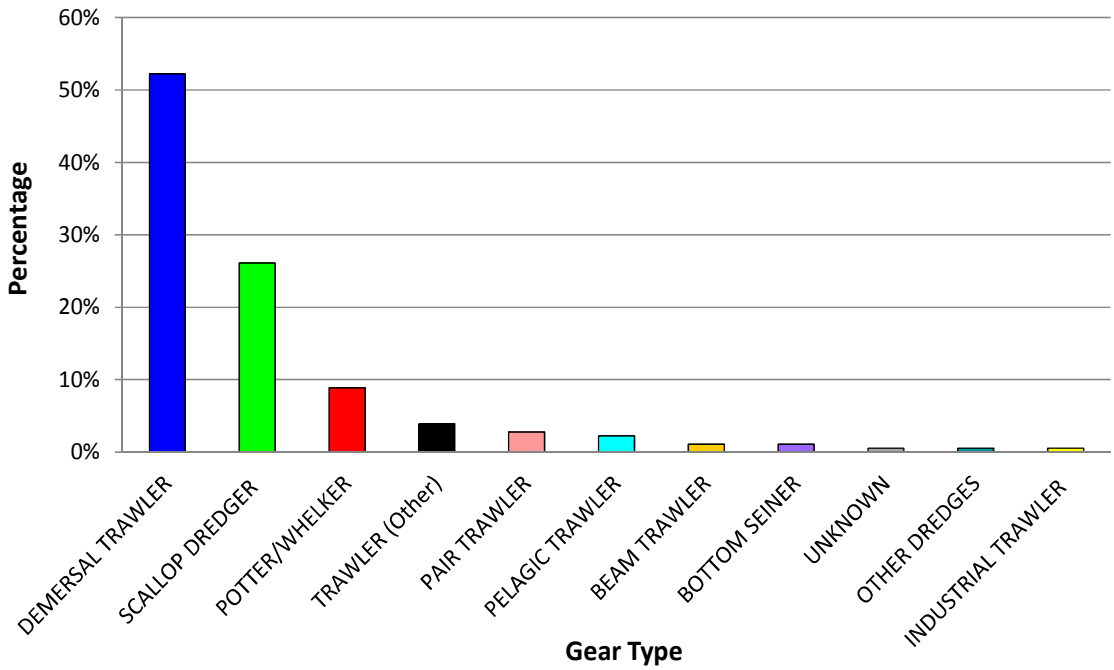

Figure 4.13 All Sightings Distributed by Gear Type

The fishing vessels colour-coded by activity when sighted are presented in Figure 4.14.

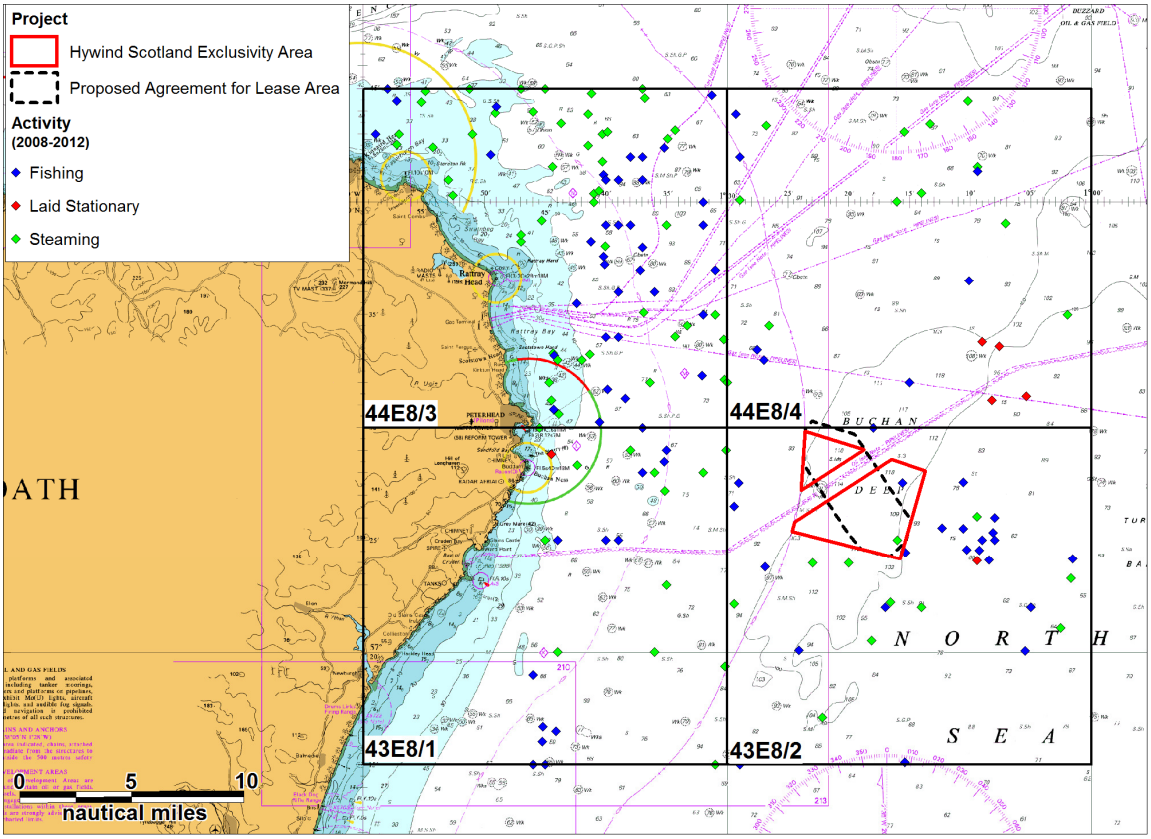

Figure 4.14 Fishing Vessel Sightings by Activity

Approximately half the vessels sighted were steaming (transiting to/from fishing grounds), and half were engaged in fishing, i.e., gear deployed. There was one of each within the Exclusivity Area.

The lengths of vessels are summarised in Figure 4.15. The majority (55%) of vessels sighted were 15-24 m in length, including both sightings within the Exclusivity Area.

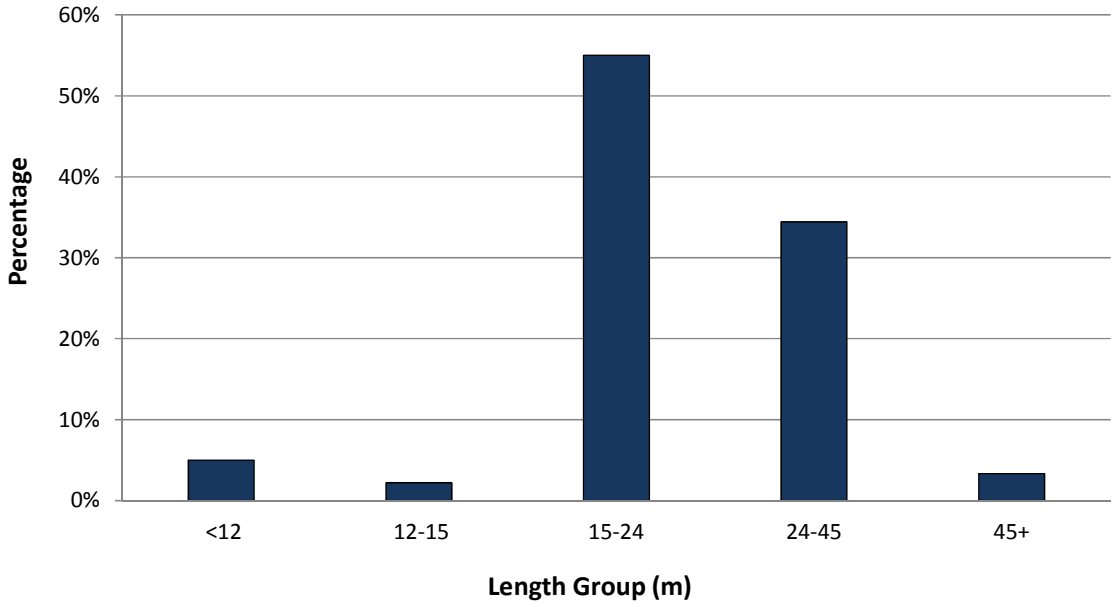

Figure 4.15 Fishing Vessel Sightings by Length Group (2008-12)

4.3 Satellite Data Analysis

The Marine Management Organisation (MMO) operates a satellite-based vessel monitoring system. The vessel monitoring system is used, as part of the sea fisheries enforcement programme, to track the positions of fishing vessels of 15 m length and over in UK waters. It is also used to track all UK registered fishing vessels globally.

Vessel position reports are typically received every 2 hours. The data covers all EC countries within British Fisheries Limits and certain Third Countries, e.g., Norway and Faeroes. Vessels used exclusively for aquaculture and operating exclusively within baselines are exempt.

Satellite data for 2011-2012, which is the latest available in GIS and includes both UK and non-UK vessels, is presented in Figure 4.16 colour-coded by nationality.

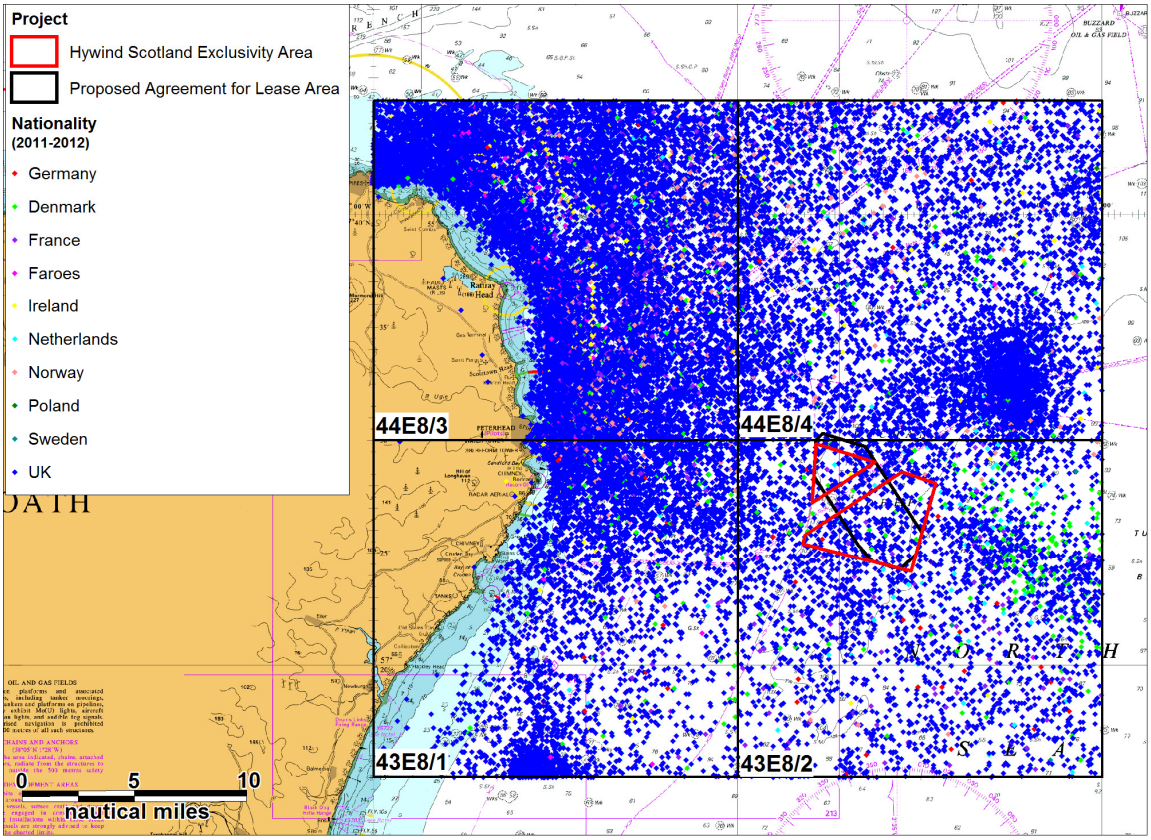

Figure 4.16 Satellite Fishing Vessel Positions by Nationality (2011-2012)

Overall, the majority of fishing vessels tracked by satellite in the ICES Subsquares and within the Hywind Scotland Exclusivity Area were registered in the United Kingdom (94%). Other countries present included Denmark, France and The Netherlands.

In terms of speeds, approximately 53% of vessel positions within the Hywind Exclusivity Area were at speeds above 5 knots and hence likely to be steaming on passage through the Exclusivity Area. The remaining 47% were travelling at speeds below 5 knots and hence may have been engaged in fishing.

Figure 4.17 presents satellite fishing vessel positions colour-coded by speed.

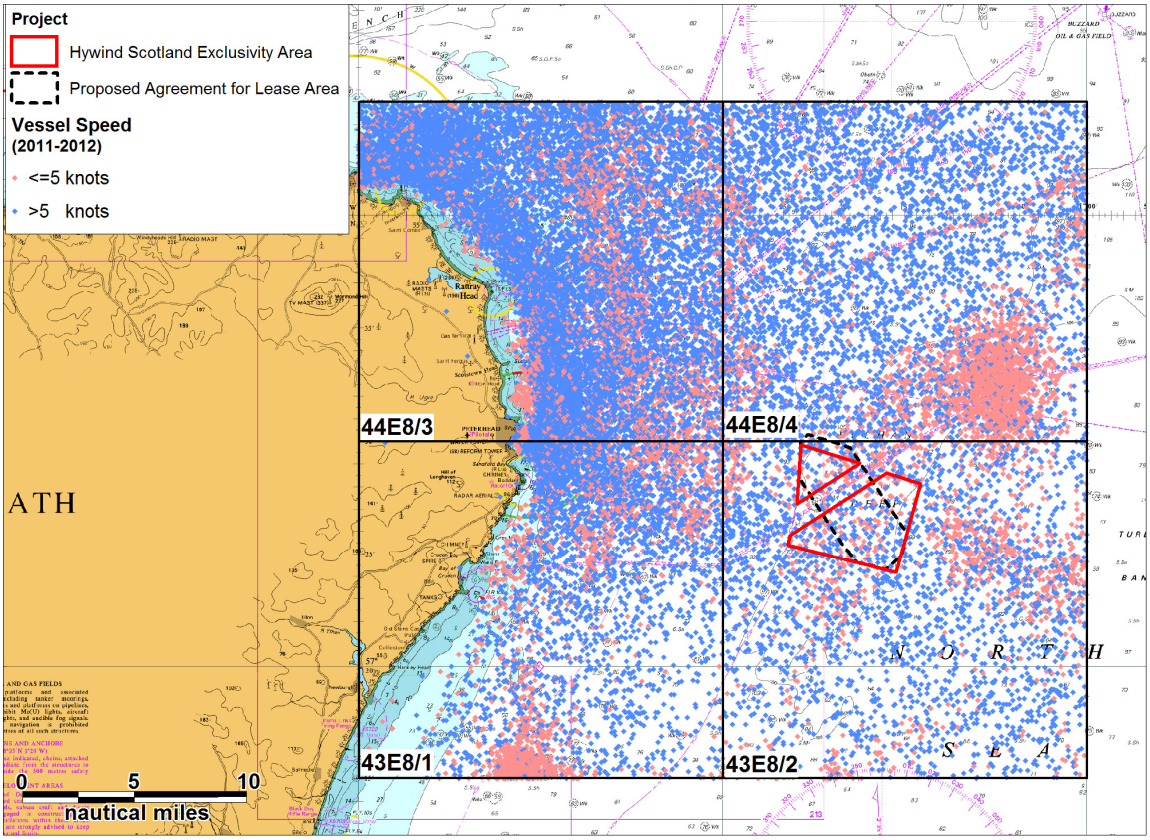

Figure 4.17 Satellite Fishing Vessel Positions by Vessel Speed (2011-2012)

4.4 Recreational Vessel Activity

This section reviews recreational vessel activity at the Hywind Scotland Exclusivity Area based on information published by the Royal Yachting Association (RYA).

The RYA, supported by the Cruising Association, have identified recreational cruising routes, general sailing and racing areas in the UK. This work was based on extensive consultation and qualitative data collection from RYA and Cruising Association members, through the organisations' specialist and regional committees and through the RYA affiliated clubs. The consultation was also sent to berth holder associations and marinas.

The results of this work were published in Sharing The Wind (RYA, 2004) (Ref. i) and updated GIS layers published in the Coastal Atlas (RYA, 2008) (Ref. ii).

A summary plot of the recreational sailing activity and facilities in the Northern North Sea area is presented in Figure 4.18.

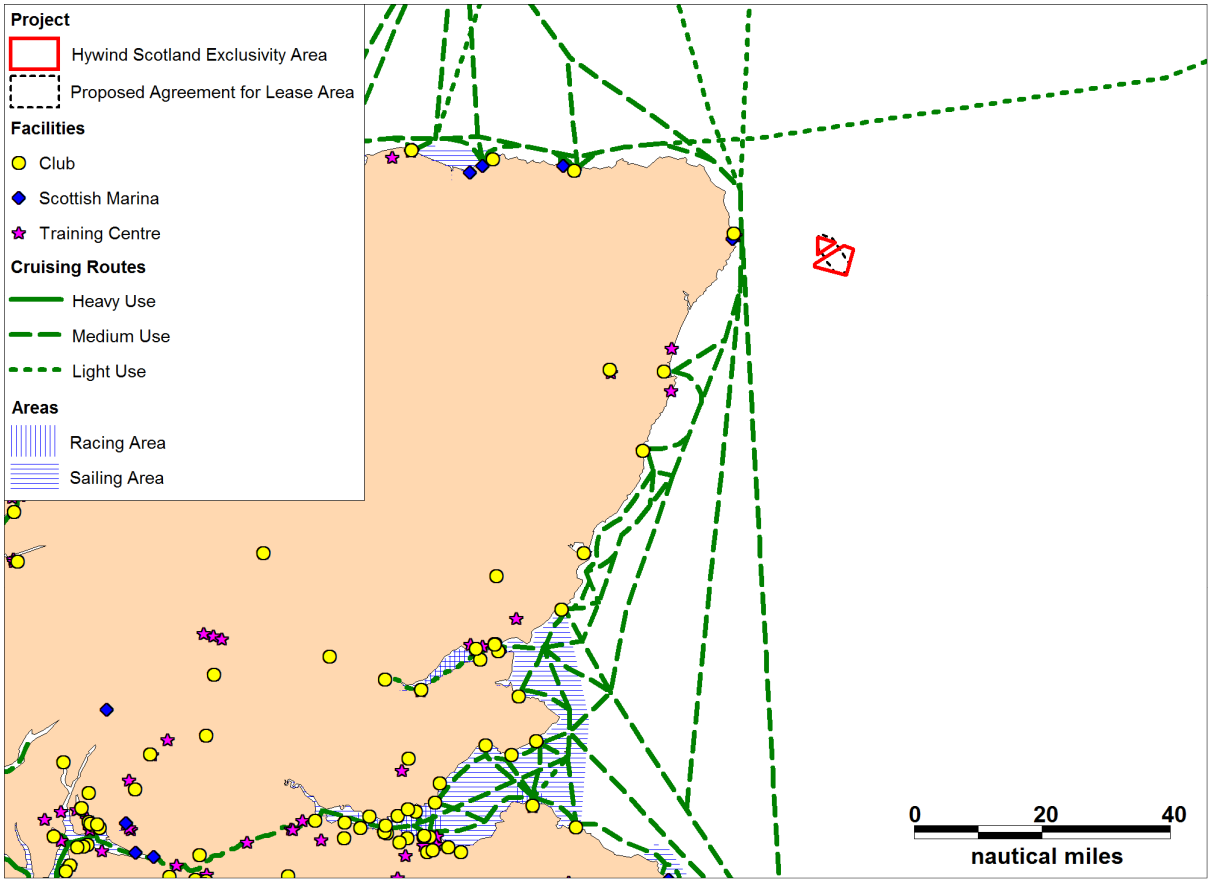

Figure 4.18 Recreational Information for Northern North Sea Area

Recreational boating, both under sail and power is highly seasonal and highly diurnal. The division of recreational craft routes into Heavy, Medium and Light Use is therefore based on the following classification:

- Heavy Recreational Routes: - Very popular routes on which a minimum of six or more recreational vessels will probably be seen at all times during summer daylight hours. These also include the entrances to harbours, anchorages and places of refuge.
- Medium Recreational Routes: - Popular routes on which some recreational craft will be seen at most times during summer daylight hours.
- Light Recreational Routes: - Routes known to be in common use but which do not qualify for medium or heavy classification.

Based on the RYA published data, the Exclusivity Area is well outside the general racing and sailing areas. There are also no cruising routes crossing the Exclusivity Area.

In terms of facilities, the nearest club is the Peterhead sailing club, 13nm west of the Hywind Scotland Exclusivity Area, and the closest marina is Peterhead Bay Marina which consists of 150 berths. Vessels of up to 22m in length can be accommodated. The available depth of water at the entrance to the marina is 2.3m below Chart Datum although vessels up to 2.8m draught can lie afloat at the deepest berths.

5. Review of Historical Maritime Incidents

5.1 Introduction

This section reviews maritime incidents that have occurred in the vicinity of the Hywind Scotland Exclusivity Area in recent years.

The analysis is intended to provide a general indication as to whether the area of the proposed development is currently low or high risk area in terms of maritime incidents. If it was found to be a particular high risk area for incidents, this may indicate that the development could exacerbate the existing maritime safety risks in the area.

The most recently available 10 years of data from the following sources has been analysed:

- Marine Accident Investigation Branch (MAIB)
- Royal National Lifeboat Institution (RNLI)

(It is noted that the same incident may be recorded by both sources.)

5.2 MAIB

All UK-flagged commercial vessels are required to report accidents to MAIB. Non-UK flagged vessels do not have to report unless they are within a UK port/harbour or within UK 12 mile territorial waters and carrying passengers to or from a UK port (including those in inland waterways). However, the MAIB will record details of significant accidents of which they are notified by bodies such as the Coastguard, or by monitoring news and other information sources for relevant accidents. The Maritime and Coastguard Agency, harbour authorities and inland waterway authorities also have a duty to report accidents to MAIB.

The locations[1] of accidents, injuries and hazardous incidents reported to MAIB within 10nm of the Hywind Scotland Exclusivity Area between 1 January 2002 and 31 December 2011 are presented in Figure 5.1, colour-coded by type.

[1] MAIB aim for 97% accuracy in reporting the locations of incidents.

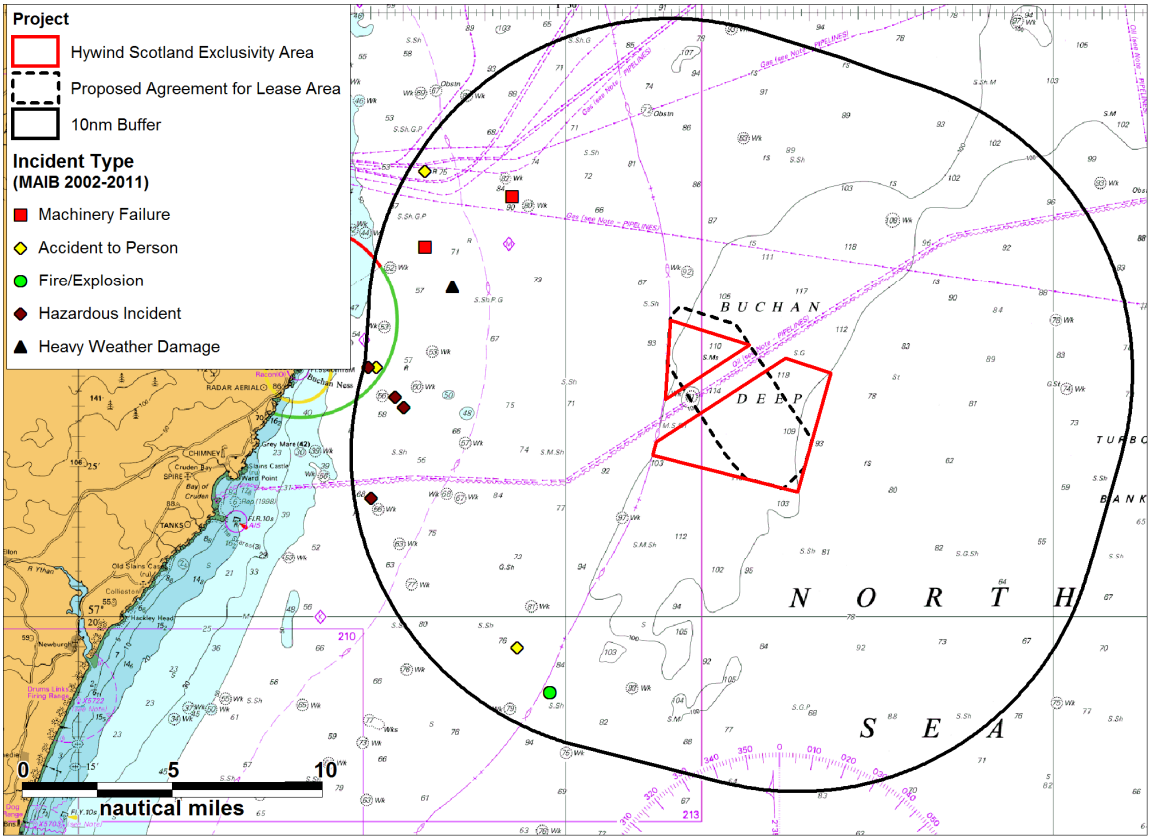

Figure 5.1 MAIB Incident Locations by Type within 10 nm of Hywind Scotland Exclusivity Area

A total of 17 incidents were reported in the area within 10 nm of the Hywind Scotland Exclusivity Area, corresponding to an average of 1-2 per year. No incidents were reported within the Hywind Scotland Exclusivity Area.

The overall distribution by incident type and vessel type is presented in Figure 5.2 and Figure 5.3, respectively. The majority of incidents involved fishing vessels and commercial vessels associated with offshore industry. The most common causes were hazardous incident [1]and accident to person.

[1] Hazardous Incidents are any events, other than accidents, associated with the operation of a ship which involve circumstances indicating that an accident nearly occurred.

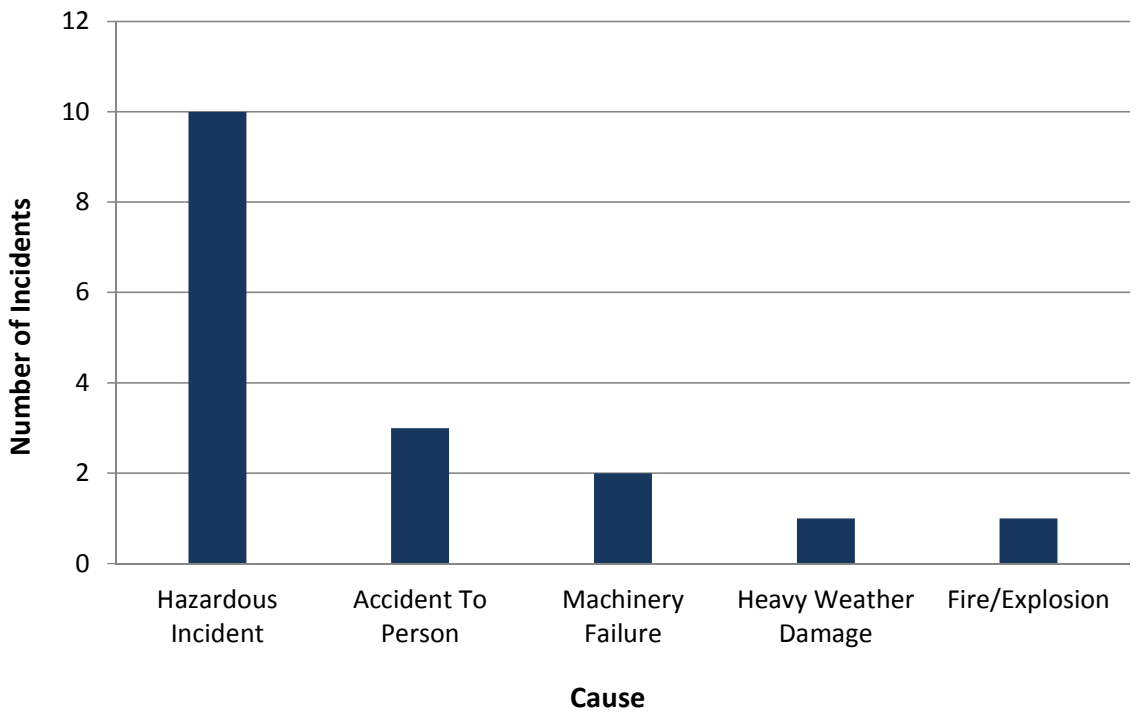

Figure 5.2 MAIB Incidents by Type within 10nm of the Exclusivity Area (2002-11)

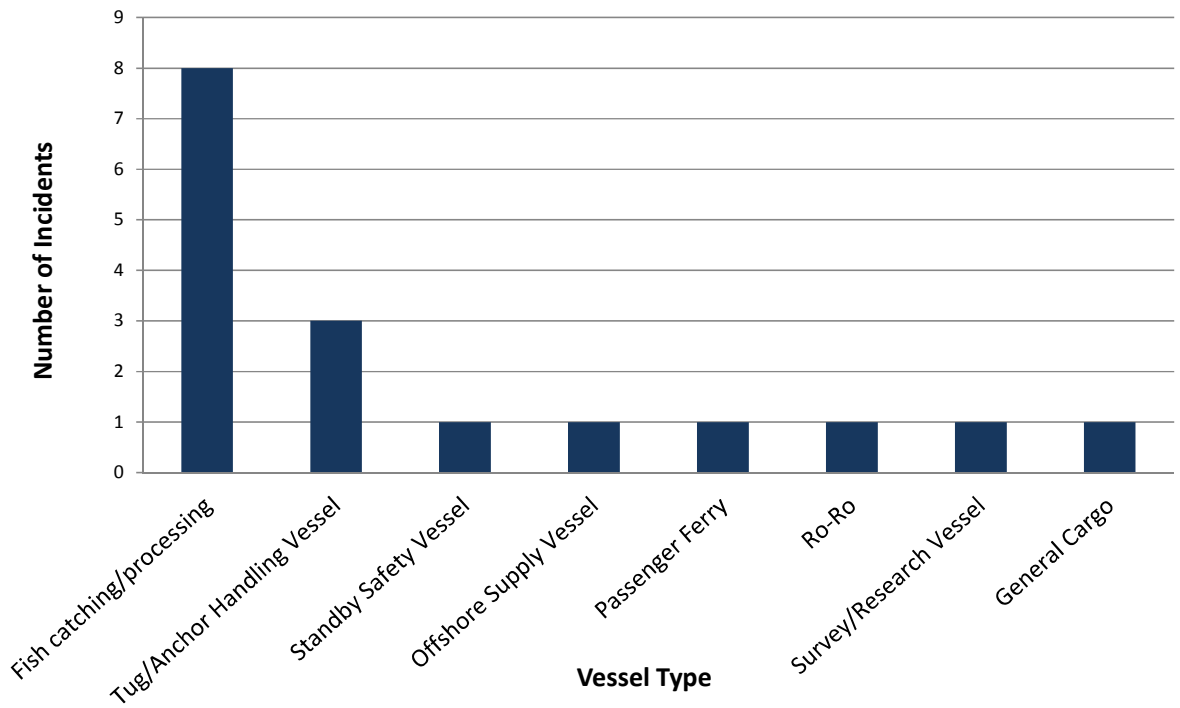

Figure 5.3 MAIB Incidents by Vessel Type within 10nm of the Exclusivity Area (2002-11)

5.3 RNLI

Data on RNLI lifeboat responses within 10nm of the Hywind Scotland Exclusivity Area in the ten-year period between 2001 and 2010 have been analysed (the most recent available). A total of 20 launches to 16 unique incidents were recorded by the RNLI (excluding hoaxes and false alarms).

Figure 5.4 presents the geographical location of incidents colour-coded by casualty type.

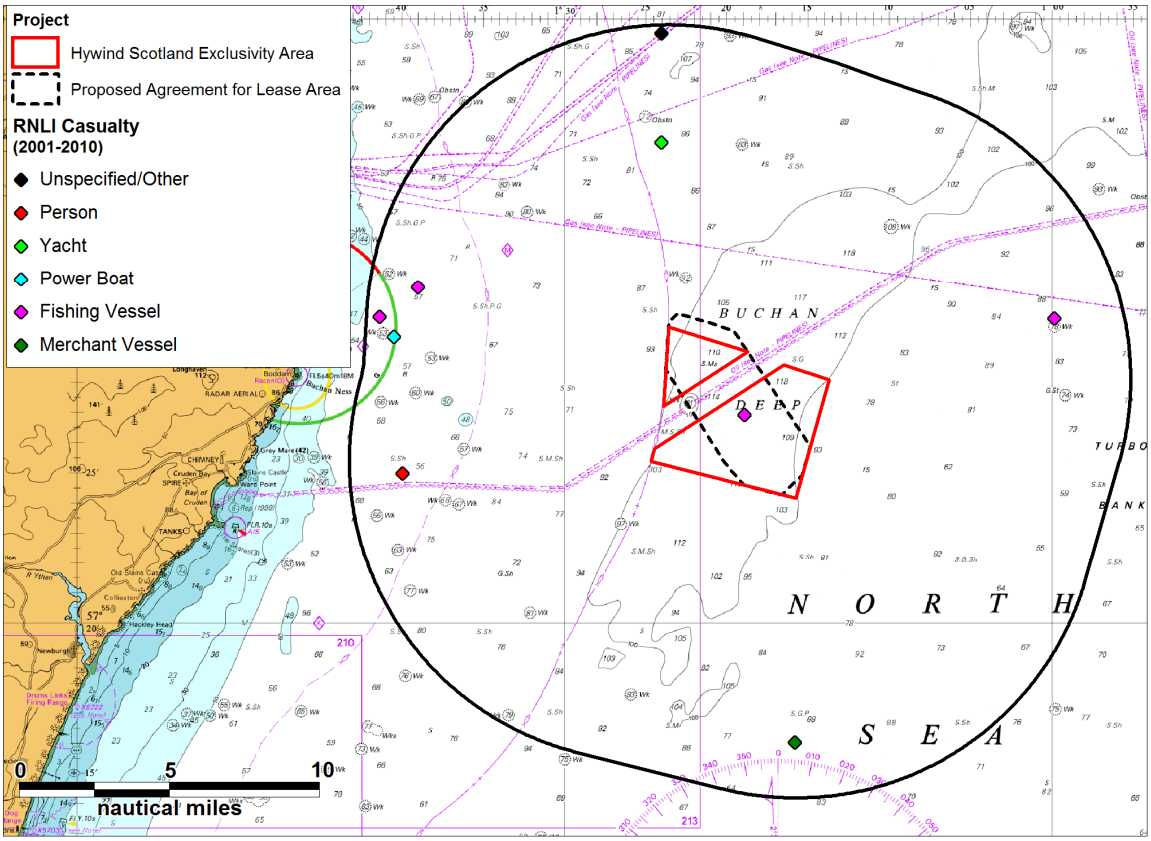

Figure 5.4 RNLI Incidents by Casualty Type within 10nm of the Hywind Scotland Exclusivity Area

There was only one incident recorded within the Exclusivity Area over the 10 years analysed. This incident involved a large fishing vessel which suffered a machinery failure on 22nd June 2001 and was responded to by Peterhead ALB.

Overall, the most common vessel types involved were fishing vessels (44%), yachts (11%), power boats (11%) and merchant vessels (11%). The main cause of incidents was machinery failure (44%).

All incidents were responded to by the Peterhead RNLI station with one exception, which was responded to by Fraserburgh RNLI.

6. Stakeholder Consultation

6.1 Introduction

This section summarises key points from the initial consultation meetings held with national and local stakeholders for the Hywind Pilot Park Project. Other stakeholders that are planned to be consulted during the NRA are also identified.

6.2 Maritime and Coastguard Agency (MCA)

A meeting with the MCA was held on 23rd July 2013 in Southampton.

The issue of fishing inside the Hywind Scotland Exclusivity Area was discussed and Statoil stated that they would effectively be looking for a trawl free zone marked by buoys. The MCA questioned how enforceable this would be and the potential difficulties in establishing such a zone. Further discussion will be necessary as the Project progresses.

MCA stated that Statoil should be aware of all the requirements of MGN 371 and noted that Statoil will require to make hydrographic survey data available to the appropriate standard (Order 1A) for UKHO to update charting information.

With respect to the traffic survey requirements for the Hywind Scotland Exclusivity Area, the MCA noted that it was a relatively small scale development. Further baseline data will be collected and consultation carried out to investigate vessel activity and seasonality, especially fishing, and following this a proposal for the survey will be presented to the MCA.

MCA stated that Statoil would need to discuss markings of the structures with the Northern Lighthouse Board (NLB) and make sure issues are covered such as remote switching of fog signals.

MCA queried the lifespan of mooring lines and what replacement plans will be in place for moving parts. Statoil noted that the chains/lines will be inspected and maintained under an inspection regime. There will also be a full inspection of each WTG Unit every year.

Search and Rescue (SAR) operations were not seen to be a big issue for such a small-scale Development Area, but would become an issue for any larger developments in other areas.

6.3 Northern Lighthouse Board (NLB)

A meeting with the Northern Lighthouse Board (NLB) was held on 6th August 2013 in Edinburgh.

NLB highlighted the importance of the Northern Lighthouse Board (NLB) with regard to identifying risks to navigation and suitable mitigation for managing / reducing risk. However, based on the information presented, NLB confirmed they had no significant concerns at this time in terms of risk to navigational safety, due to the size and location of the Hywind Scotland Pilot Park Project.

NLB indicated that markings and navigational aids, such as buoys, are likely to be required during installation. However, buoys are unlikely to be required during operation, just standard markings on the turbines.

Statoil was recommended to request a derogation from the CAA to use flashing Morse W synchronised lighting for aviation rather than the standard fixed red lighting, as the latter can cause confusion to ships.

A joint meeting with the MCA, NLB and Royal Yachting Association (RYA) would be welcomed to discuss further issues as the Environmental Impact Assessment (EIA) and NRA progress.

6.4 Royal Yachting Association (RYA)

A meeting with the Royal Yachting Association (RYA) was held on 6th August 2013 in Edinburgh.

RYA agreed with the PHA baseline data that the number of recreational vessels within the Hywind Scotland Exclusivity Area would be very low. The marina at Peterhead is mainly used as a stop off point for people heading to, or returning from, the Northern Isles via the east coast. Cruising vessels are very unlikely to be passing through the Buchan Deep. There are likely to be limited trips east-west between Peterhead and Stavanger, etc.

It was noted that the RYA Cruising Atlas is currently being updated but it was confirmed that the routes shown (as used in the PHA) were representative of the sailing routes in the area. It was noted that recreational charts are sometimes updated less frequently than Admiralty Charts and that up-to-date charts, with developments clearly marked, were important for safely passing navigational features like energy developments.

During the meeting the minimum air draught [1]was discussed. The RYA's position statement recommends a minimum gap of 22 m above Mean High Water Springs. However, due to the floating design of the Project (i.e., any gap will remain constant in all tidal states) and very low numbers of recreational vessels, a 20 m gap may be sufficient.

Further discussion on the air draught will be required as the Project develops. RYA would welcome joint meetings with the other navigational stakeholders as the EIA and NRA progress.

6.5 Peterhead Port Authority (PPA)

A meeting with Peterhead Port Authority (PPA) took place on 11th July 2013 in Peterhead. PPA gave an overview of the port's capacity and facilities, as well as plans for further development. The port is a major offshore supply base as well as the largest white fish port in Europe.

[1] The vertical distance measured from the waterline to the WTG Unit rotor blade in the 6 o'clock position.

There is a marina for recreational craft. It was indicated that a few yachts cross the North Sea between Peterhead and Scandinavia. More detailed records are available and will be requested for the NRA.

PPA is keen on supporting the Hywind Scotland Pilot Park Project as the port is currently working towards establishing Peterhead as a green 'Eco-Port' and would like to introduce renewables into the long term development plan. Statoil is looking at the possibility of long term cooperation by using Peterhead Port as the O & M base with berths for supply and maintenance vessels. It is likely that vessel(s) will also be needed occasionally to take visitors to the site.

The proposed cable route options were discussed. The port advised avoiding the Harbour Limits where vessels could be anchored. Fishing activity was also discussed as this will be a factor in the final decision.

In terms of navigational impacts, no significant concerns were raised.

6.6 Other Stakeholders

Statoil have held meetings with the Scottish Fishermen's Federation (SFF) about the project, and they will be further consulted specifically on navigational safety issues during the NRA.

Aberdeen Harbour Board were sent a briefing letter and indicated no issues with the proposal, however, the Harbour will be consulted directly during the NRA.

Consultations are also planned with the following:

- Chamber of Shipping
- Cruising Association
- HM Coastguard (Aberdeen)
- Royal National Lifeboat Institution (Peterhead)
- Marine Safety Forum
- Local Ship Operators (to be identified from AIS data)

7. Preliminary Hazard Analysis

7.1 Introduction

This section provides a preliminary review of the vessel exposure and potential navigational hazards associated with the Hywind Scotland Pilot Park Project based on the existing vessel activity in the area identified from the baseline data collection. Potential mitigation measures to control the hazards are also discussed.

7.2 Overview of Vessel Exposure

From the baseline data collection it was been identified that there is commercial shipping and fishing vessel activity in the Hywind Scotland Exclusivity Area, although this is less busy than coastal areas inside the 12nm limit. No significant recreational vessel activity was identified.

The MCA have published guidance to mariners operating in the vicinity of offshore renewable energy installations (OREI) (MCA, 2008) (Ref. iii). The guidance suggests three options, in simple terms, for mariners operating in OREI areas:

a. Avoid the area completely
b. Navigate around the edge
c. Navigate, with caution, through the array

The choice will be influenced by a number of factors including the vessel's characteristics (type, tonnage, draught, manoeuvrability, etc.), the weather and sea conditions. The guidance suggests that where there is sufficient sea room it is prudent to avoid the area completely.

The choice will also depend on the navigational features of the area, for example, the sea room and water depth available at the edges of the development.

It is considered likely that, given the limited footprint area of the Hywind Scotland Pilot Park Project, comprising five turbines, and the sea room surrounding it, transiting vessels will be able to avoid the area. There could be a snagging hazard for any fishing vessels seeking to trawl in the area of cables and the mooring lines.

A discussion of specific hazards and how they will be addressed within the NRA is presented below for the main phases of the Hywind Scotland Pilot Park Project. Additional hazards will be identified during the NRA process, including the Hazard Review Workshop (see Section 8).

7.3 Hazard Review

7.3.1 Normal Operations

During normal operations, the turbines will present a surface collision hazard. As noted earlier, experience indicates the WTG units can move around 50-60m laterally, depending on the mooring system design.

It is straightforward to assess this hazard based on the installation locations and dimensions, vessel activity, etc. This will be carried out for merchant shipping, fishing vessels and recreational craft.

For yachts, the risk of rotor blade / mast interaction will be investigated based on the planned air clearance of the turbines and data on the air draught of yachts using the area, such as from Peterhead Marina records.

Any changes in vessel routeing due to the development, e.g., displacement of vessels around the site, will influence the probability of vessels encountering (and colliding) with one another in the area. A comparison will be made between the current and predicted routeing and associated collision risk levels will be modelled.

Subsea cabling could present a snagging hazard to fishing gear and vessel anchors. Once the cable route is finalised these hazards will be assessed based on the vessel activity in the area, anchorage areas, fishing vessel gear types and the planned protection measures.

The potential effect of the wind turbines on marine electronics equipment, including ship and port radar systems, will be reviewed.

Finally, the potential for loss of station of a device will be investigated, taking into account redundancy of the mooring system.

7.3.2 Construction, Maintenance and Decommissioning

For all vessels operating in the area there will be risks during installation, removal and to a lesser extent maintenance, when there will be additional vessels in and around the site associated with the development, some of which may have restricted manoeuvrability. This will extend beyond the site in the case of cable-laying operations.

This introduces a collision hazard (vessel-to-vessel) as well as potential obstruction to normal routes beyond the study area.

This will be assessed within the NRA based on the best available information on the likely areas of operation, number and types of vessels involved, base ports, duration of operations and weather limits. A review of the planned towage operation from the assembly site will be included within the NRA.

7.4 Assembly and Tow

In addition to the Hywind Scotland Exclusivity Area and associated offshore infrastructure, the project will use a deep water inshore area to assemble the WTG Units prior to installation. Once assembled, the WTG Units will be towed in an upright position from the assembly point to the Pilot Park.

These operations will have additional shipping and navigation hazards which will be assessed within the NRA once more details on the assembly point are available. For example, during the towing operation there will be a grounding risk and also a risk of encounters / collisions with other vessels.

7.5 Mitigation Measures

Appropriate risk control measures will be developed during the NRA to address the risks during all phases of operation to ensure they are reduced to a level as low as reasonably practicable (ALARP).

In addition to preventive mitigation in the form of site selection and shaping, there are a large number of measures that can be applied to help control navigation risks, many of which are now standard industry practice such as:

- Depiction on Charts
- Marking and Lighting
- Circulation of Notices to Mariners
- Fisheries Liaison
- Safety Zone and Guard Vessel (during major work on site)

Discussions will be held with national and local stakeholders, such as the MCA NLB, SFF and local ports and ship operators to ensure these and other measures are implemented as effectively as possible for the development, taking into account vessel activity.

The potential for an Area To Be Avoided (ATBA) to protect trawling fishing vessels from the risk of snagging with the mooring lines will be investigated further at this stage.

8. Proposed Methodology – Navigation Risk Assessment

The assessment methodology will principally be based on the following:

- Department for Energy and Climate Change (DECC) Methodology for Assessing the Marine Navigational Safety Risks of Offshore Windfarms (2005); and

- Maritime and Coastguard Agency (MCA) Marine Guidance Notice 371 (MGN 371) Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues.

The DECC methodology, which was developed with the MCA and DfT, provides a template for preparing a Navigation Risk Assessment (NRA). The methodology is centred on risk controls and the feedback from risk controls into risk assessment. It requires a submission that shows that sufficient risk controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with further controls or actions. The DECC assessment methodology includes:

- defining a scope and depth of the submission proportionate to the scale of the development and the magnitude of the risk;
- estimating the 'base case' level of risk;
- estimating the 'future case' level of risk;
- creating a hazard log;
- defining risk control and creating a risk control log;
- predicting 'base case with windfarm' level of risk; and
- predicting 'future case with windfarm' level of risk.

The key features of the Marine Safety Navigational Risk Assessment Methodology are risk assessment (supported by appropriate techniques and tools), creating a hazard log, defining the risk controls (in a Risk Control Log) required to achieve a level of risk that is broadly acceptable (or tolerable with controls or actions), and preparing a submission that includes a Claim, based on a reasoned argument, for a positive consent decision.

The MCA guidance MGN 371 highlights issues that need to be taken into consideration when assessing the impact on navigational safety from offshore renewable energy developments in the UK. Specific annexes that address particular issues include:

- Annex 1: Site position, structures and safety zones;
- Annex 2: Developments, navigation, collision avoidance and communications;
- Annex 3: MCA's windfarm shipping template for assessing windfarm boundary distances from shipping routes;

- Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning; and
- Annex 5: Search and Rescue (SAR) matters.

The approach to carrying out the NRA in accordance with requirements of MGN 371, including requirements for the collection of additional data on vessel movements through the area is the subject of on-going consultations with the MCA. A detailed description of the NRA methodology will be presented in the NRA Report.

Consultation will be carried out about the development as selection of the final deployment site within the Exclusivity Area progresses and potential layouts are developed. Consultation is also likely to be required in relation to the final selected inshore assembly area and tow route to the Buchan Deep.

Local stakeholders representing all the different maritime interests, including ports, fishing, shipping, oil & gas, recreation and emergency services, will be invited to the Hazard Review Workshop, which is a key part of the NRA and a useful method of identifying additional risk controls.

Other key guidance and reference materials that will be used in the assessment are listed below:

- MCA Marine Guidance Notice 372 (2008). Guidance to Mariners Operating in the Vicinity of UK OREIs
- IALA Recommendation O-139 On The Marking of Man-Made Offshore Structures, 1st Edition, December 2008
- DECC Guidance Notes on Applying for Safety Zones around Offshore Renewable Energy Installations
- IMO Guidelines for Formal Safety Assessment (FSA)
- Results of the EM Investigations and assessments of marine radar, communications and positioning systems undertaken at the North Hoyle Windfarm by QinetiQ and the MCA;
- BWEA, DTI, MCA & PLA (2007). Investigation of Technical and Operational Effects on Marine Radar Close to Kentish Flats Offshore Windfarm; and

The Navigational Risk Assessment (NRA) report will be submitted as a technical annex within the Environmental Statement (ES) as part of the Marine Licence application. It will also be summarised within a chapter of the ES.

9. References

i RYA, Sharing the Wind, 2004.

ii UK Coastal Atlas of Recreational Boating; Recreational Cruising Routes, Sailing and Racing Areas around the UK Coast; Second Edition by RYA; Supported by Trinity House, 2008.

iii MCA Marine Guidance Notice 372, Guidance to Mariners Operating in the Vicinity of UK OREIs, August 2008.

APPENDIX D MARINE NOISE DESK STUDY

Hywind Scotland Pilot Park Project
Marine Noise Desk Study
Statoil ASA

Assignment Number: A100142-S00
Document Number: A-100142-S00-TECH-003

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Marine Noise Desk Study

A100142-S00

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Table of Contents

1 INTRODUCTION 4

2 ACOUSTIC CONCEPTS AND TERMINOLOGY 5

3 SUGGESTED THRESHOLDS FOR ASSESSING THE EFFECTS OF SOUND ON MARINE MAMMALS AND FISH 7

3.1 Injury 7
3.2 Mortality 8
3.3 Disturbance 8
3.4 Summary of Suggested Criteria 9

4 REVIEW OF 'HYWIND I' UNDERWATER NOISE DATA 11

5 FURTHER ANALYSIS RELATING TO HYWIND SCOTLAND 13

5.1 Tonal Sound from Operation 13
5.2 Snapping Sound 13
5.3 Construction and Installation 14

6 DATA REQUEST 15

6.1 Operational Noise Data Request 15
6.2 Construction and Assembly Noise Data Request 15

7 CONCLUSIONS 16

1 INTRODUCTION

The Hywind turbine represents the world's first full-scale floating wind turbine. Statoil's concept for the Hywind turbine was to create a floating wind turbine that can be operated in waters in excess of 100 m depth that is based on conventional technology and has a simple substructure design. In 2009 a full-scale demonstration turbine (Hywind I) was installed 10 km off the Norwegian west-coast. This 2.3 MW turbine, which has been tested and operated successfully for the last four years, has been verified as a technically viable concept. In order to continue towards achieving the long term vision for developing floating wind on a commercial scale, Statoil is planning to develop a number of Pilot Parks which will be used to demonstrate technological improvements, operation of multiple units, and cost reductions in a park configuration. Hywind Scotland is the first of the pilot parks to be taken forward for development.

The Hywind Scotland pilot park will consist of up to five turbines with a maximum installed capacity of 30 MW. The turbines will be located between 720 and 1,500 m apart and will be attached to the seabed by a three-point mooring spread. Depending on seabed conditions, the moorings will be secured with the most suitable type of anchor. The anchor types currently under consideration include torpedo anchors, suction anchors or weight anchors. The mooring lines are likely to be composed of chains with a diameter extending out from the Hywind turbines to approximately 800 to 1,000 m.

Noise is readily transmitted underwater and there is potential for sound emissions from construction and operation of Hywind to affect marine mammals and fish. By using a floating structure, the installation noise is much reduced by removing the need for driven piles. However, there are likely to be noise impacts due to operation of the turbines as well as other construction activities, such as cable installation and use of vessels. At long ranges the introduction of additional noise could potentially cause short-term behavioural changes, for example to the ability of cetaceans to communicate and to determine the presence of predators, food, underwater features and obstructions. At close ranges and with high noise source levels, permanent or temporary hearing damage might occur, while at very close range, gross physical trauma is possible.

This report provides a high level overview of the potential impacts due to underwater noise from Hywind on the surrounding environment. In particular, this report reviews the underwater noise measurements and analysis previously undertaken by Statoil on the Hywind I demonstrator installed offshore Norway, to assess operational noise from the turbines. The report also makes recommendations for the types of impacts identified should be addressed in the EIA in terms of marine noise.

2 ACOUSTIC CONCEPTS AND TERMINOLOGY

Sound travels through the water as vibrations of the fluid particles in a series of pressure waves. The waves comprise a series of alternating compressions (positive pressure variations) and rarefactions (negative pressure fluctuations). Because sound consists of variations in pressure, the unit for measuring sound is usually referenced to a unit of pressure, the Pascal (Pa). The unit usually used to describe sound is the decibel (dB) and, in the case of underwater sound, the reference unit is taken as 1 µPa, whereas airborne sound is usually referenced to a pressure of 20 µPa. To convert from a sound pressure level referenced to 20 µPa to one referenced to 1 µPa, a factor of 20 log (20/1) i.e. 26 dB has to be added to the former quantity. Thus a sound pressure of 60 dB re 20 µPa is the same as 86 dB re 1 µPa, although care also needs to be taken when converting from in air to in water noise levels due to the different sound speeds and densities of the two mediums. All underwater sound pressure levels in this report are described in dB re 1 µPa. In water the sound source strength is defined by its sound pressure level in dB re 1µPa, referenced back to a representative distance of 1 m from an assumed (infinitesimally small) point source. This allows calculation of sound levels in the far-field. For large distributed sources, the actual sound pressure level in the near-field will be lower than predicted.

There are several descriptors used to characterise a sound wave. The difference between the lowest pressure variation (rarefaction) and the highest pressure variation (compression) is the peak to peak (or pk-pk) sound pressure level. The difference between the highest variation (either positive or negative) and the mean pressure is called the peak pressure level. Lastly, the root mean square (rms) sound pressure level is used as a description of the average amplitude of the variations in pressure over a specific time window. These descriptions are show graphically in Figure 2.1.

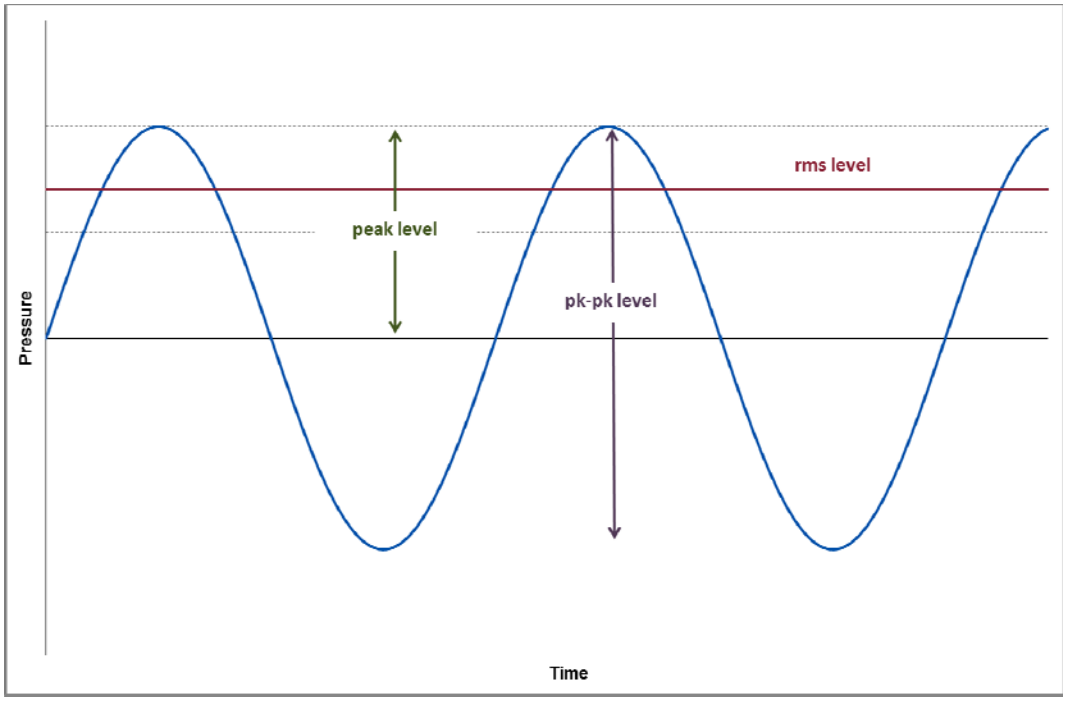

Figure 2.1 Graphical representation of acoustic wave descriptors

Another useful measure of sound used in underwater acoustics is the Sound Exposure Level, or SEL. This descriptor is used as a measure of the total sound energy of an event or a number of events (e.g. over the course

of a day) and is normalised to one second. This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like for like basis[1].

The frequency, or pitch, of the sound is the rate at which these oscillations occur and is measured in cycles per second, or Hertz (Hz). When sound is measured in a way which approximates to how a human would perceive it using an A-weighting filter on a sound level meter, the resulting level is described in values of dBA. However, the hearing faculty of marine mammals is not the same as humans, with marine mammals hearing over a wider range of frequencies and with a different sensitivity. It is therefore important to understand how an animal's hearing varies over the entire frequency range in order to assess the effects of sound on marine mammals. Consequently use can be made of frequency weighting scales to determine the level of the sound in comparison with the auditory response of the animal concerned. A comparison between the typical hearing response curves for fish, humans and marine mammals is shown in Figure 2.2. (It is worth noting that hearing thresholds are sometimes shown as audiograms with sound level on the y axis rather than sensitivity, resulting in the graph shape being the inverse of the graph shown.)

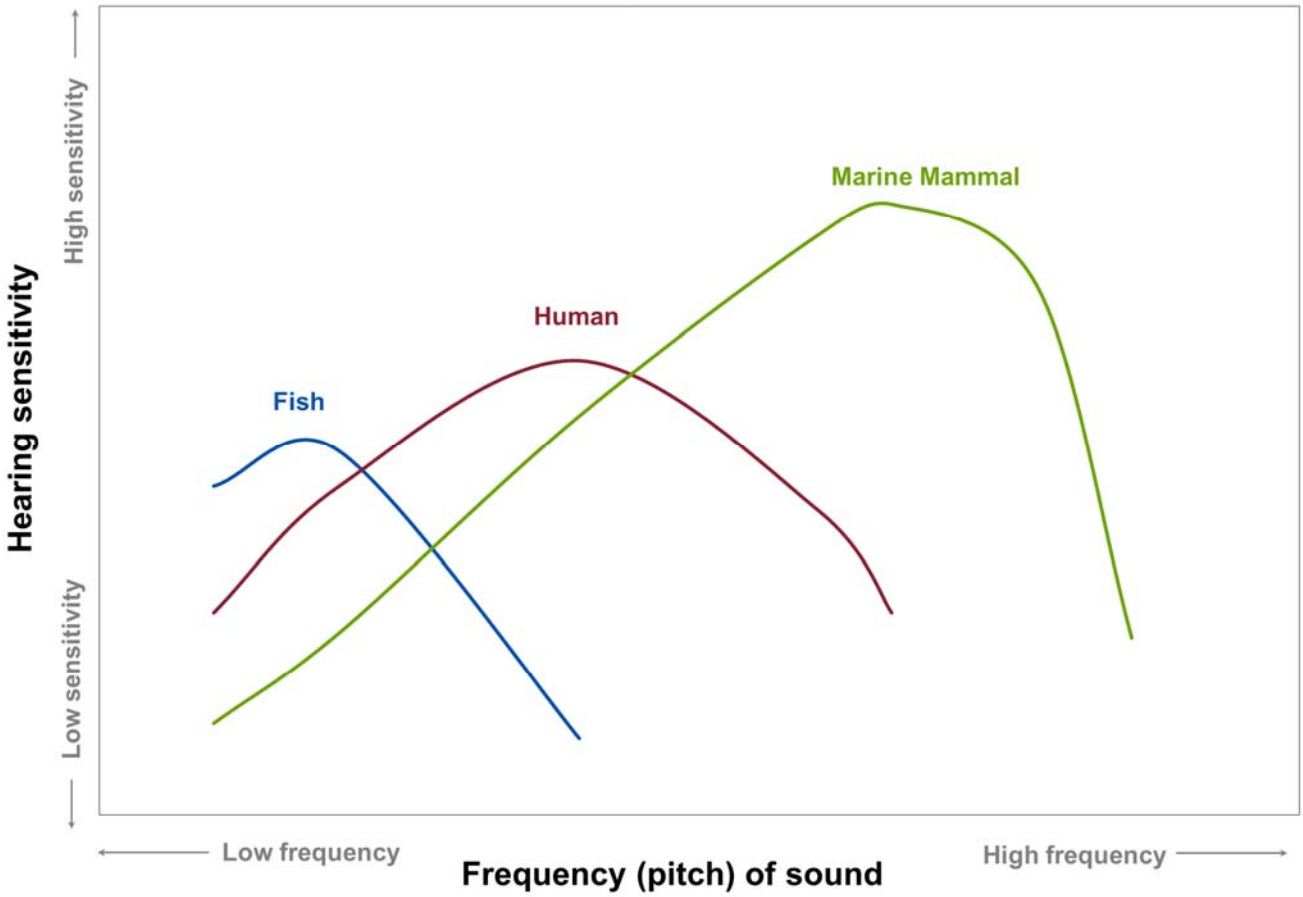

Figure 2.2 Comparison between hearing thresholds of different animals

[1] *Historically, use was primarily made of rms and peak sound pressure level metrics for assessing the potential effects of sound on marine life. However, the SEL is increasingly being used as it allows exposure duration and the effect of exposure to multiple events to be taken into account.*

3 SUGGESTED THRESHOLDS FOR ASSESSING THE EFFECTS OF SOUND ON MARINE MAMMALS AND FISH

3.1 Injury

A number of thresholds or methods for determining thresholds exist (e.g. the dB_{ht} method described by Nedwell et al. 2007) and each has advantages and disadvantages. For marine mammals, JNCC guidance recommends using the injury criteria proposed by Southall *et al.* 2007, which are based on a combination of linear (i.e. un-weighted) peak pressure levels and mammal hearing weighted (M-weighted) sound exposure levels (SEL). The M-weighting function is designed to represent the bandwidth for each group where acoustic exposures can have auditory effects and is shown graphically in Figure 3.1.

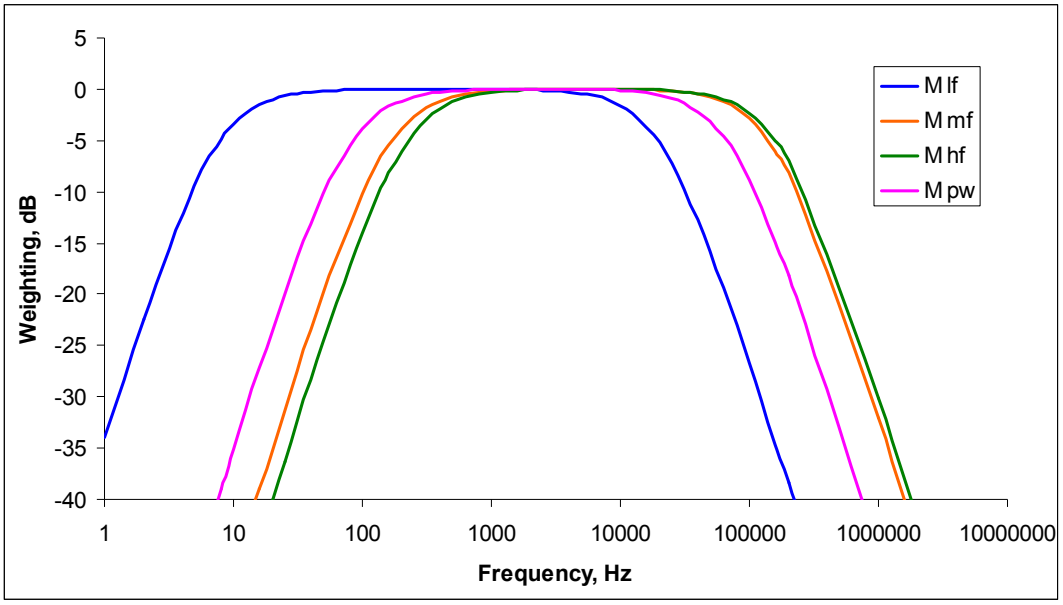

Figure 3.1 M-weighting functions for pinnipeds and cetaceans in water (lf = low-frequency, mf = mid-frequency, hf = high-frequency, pw = pinniped in water)

The proposed injury criteria for single and multiple pulses described by Southall *et al.* are a peak pressure level of 230 dB re 1 μPa and an M-weighted Sound Exposure Level (SEL) of 198 dB re 1 μPa^2s for all cetaceans. These injury criteria values are derived from values for onset of Temporary Threshold Shift (TTS) with an additional allowance of +6 dB for peak noise and + 15 dB for SEL to estimate the potential onset of Permanent Threshold Shift (PTS). The Southall document states that these thresholds represent suitable levels for a precautionary approach.

It has been reported by Lucke *et al.* 2009 that the onset of TTS in harbour porpoises might have a lower threshold, with the onset of TTS at 200 dB re 1 μPa peak-peak (equivalent to 194 dB re 1 μPa peak) and a sound exposure level of 164 dB re 1 μPa^2s (un-weighted). JNCC suggests that these lower thresholds for TTS could be used to provide an estimation of PTS for these mammals. By applying the PTS onset calculation from Southall, this results in a peak level injury criterion of 200 dB re 1 μPa (i.e. by adding +6 dB to the peak level for TTS). It is, however, difficult to derive equivalent SEL criteria using the Lucke study because the reported SELs are un-weighted, and not M-weighted as used in Southall. Nevertheless, assuming that the hf M-weighting correction is relatively small, this would result in a revised SEL criterion of 179 dB re 1 μPa^2s.

The proposed injury criteria relating to this project are summarised in Table 3.1.

Marine Mammal Group	Type of sound	Injury Criteria - underwater	
		Peak pressure, dB re 1 µPa	SEL, dB re 1 µPa^2.s (M-weighted)
Low-frequency cetaceans	Single or multiple pulses	230	198
	Non-pulses	230	215
Mid-frequency cetaceans	Single or multiple pulses	230	198
	Non-pulses	230	215
High-frequency cetaceans (other than harbour porpoise)	Single or multiple pulses	230	198
	Non-pulses	230	215
Harbour porpoise	Single or multiple pulses	200	179
	Non-pulses	200	196
Pinnipeds in water	Single or multiple pulses	218	186
	Non-pulses	218	203

Table 3.1 Suggested criteria for onset of injury criteria (per 24 hr period in water)

3.2 Mortality

Few data are available on the mortality of marine species, although there are generalised guidelines on the effects of transient pressure peaks (Parvin, Nedwell, and Harland 2007). These are classified as:

- Incident peak underwater sound levels > 260 dB re: 1 µPa (peak) - always lethal;
- Incident peak underwater sound levels > 240 dB re: 1 µPa (peak) - increased likelihood of death/ severe injury; and
- Incident peak underwater sound levels > 220 dB re: 1 µPa (peak) - direct physical injury may occur especially for repeated exposures.

3.3 Disturbance

Beyond the area in which injury may occur, the effect on marine mammal behaviour is the most important measure of impact. The JNCC guidance proposes that a disturbance offence may occur when there is a risk of animals incurring sustained or chronic disruption of behaviour or when animals are displaced from an area, with subsequent redistribution being significantly different from that occurring due to natural variation.

To consider the possibility of a disturbance offence resulting from the project, it is necessary to consider both the likelihood that the sound could cause non-trivial disturbance and the likelihood that the sensitive receptors will be exposed to that sound. Southall et al. (2007) recommended that the only currently feasible way to assess whether a specific sound could cause disturbance is to compare the circumstances of the situation with empirical studies. The JNCC guidance (2010) indicates that a score of 5 or more on the Southall *et al*. (2007) behavioural response severity scale could be significant. The more severe the response on the scale, the lower the amount of time that the animals will tolerate it before there could be significant negative effects on life functions, which would constitute a disturbance under the relevant regulations.

Southall *et al.* (2007) present a summary of observed behavioural responses for various mammal groups exposed to different types of noise (single pulse, multiple pulse and non-pulse). For non-pulsed sound (e.g. operational noise, vessels etc.), the lowest sound pressure level at which a score of 5 or more occurs for low frequency

cetaceans is 90 - 100 dB re 1 µPa (rms). This relates to a study involving migrating Gray whales. The only study for Minke wales showed a response score of 3 at a received level of 100 – 110 dB re 1 µPa (rms), with no higher severity score encountered for this species. For mid frequency cetaceans, a response score of 8 was encountered at a received level of 90 - 100 dB re 1 µPa (rms), but this was for one mammal (a sperm whale). For White-beaked dolphin and Atlantic white-sided dolphin, a response score of 3 was encountered for received levels of 110 – 120 dB re 1 µPa (rms), with no higher severity score encountered. For high frequency cetaceans, there are a number of individual response score 6 rankings ranging from 80 dB re 1 µPa (rms) and upwards, but there is a significant increase in the number of mammals responding once the received sound pressure level is greater than 140 dB re 1 µPa (rms).

The Southall *et al.* (2007) document presents a summary of observed behavioural responses due to multiple pulsed sound, although the data is primarily based on responses to seismic exploration activities. Although these datasets contain much relevant data for low-frequency cetaceans, there is no strong data for mid-frequency or high-frequency cetaceans. Low frequency cetaceans other than bow-head whales were typically observed to respond significantly at a received level of 140 – 160 dB re 1 µPa (rms). Behavioural changes at these levels during multiple pulses may have included visible startle response, extended cessation or modification of vocal behaviour, brief cessation of reproductive behaviour or brief / minor separation of females and dependent offspring. The data that is available for mid-frequency cetaceans indicates that some significant response was observed at an sound pressure level of 120 - 130 dB re 1µPa (rms), although the majority of cetaceans in this category did not display behaviours of this severity until exposed to a level of 170 – 180 dB re 1µPa (rms). Furthermore, other mid-frequency cetaceans within the same study were observed to have no behavioural response even when exposed to a level of 170 – 180 dB re 1µPa (rms).

Clearly, there is much intra-category and perhaps intra-species variability in behavioural response. As such, a conservative approach should be taken to ensure that the most sensitive cetaceans remain protected.

The High Energy Seismic Survey workshop on the effects of seismic sound on marine mammals (HESS, 1997) concluded that behavioural disturbance would most likely occur at sound levels greater than 140 dB re 1 µPa (rms). This workshop drew on studies by Richardson *et al.* 1995 but recognised that there was some degree of variability in reactions between different studies and mammal groups. Although the workshop was concerned with the effects of seismic surveys, it is considered that the findings could be extended to include other types of sound, in the absence of any other strong evidence.

For assessing the likelihood of behavioural effects in fish, use can be made of the dB_{ht}(*species*) scale. This is simply a decibel scale reflecting the level above the hearing threshold (i.e. quietest perceptible sound) of that species. A typical scale for predicting the likelihood of disturbance is presented in Table 3.2.

Noise Level	Likelihood of disturbance
0 – 50 dB_{ht} (*Species*)	Low likelihood of disturbance
75 dB_{ht} (*Species*)	Mild avoidance reaction occurs in a majority of individuals
90 dB_{ht} (*Species*)	Strong avoidance reaction by most individuals

Table 3.2 Quantitative assessment of likelihood of disturbance

3.4 Summary of Suggested Criteria

The suggested criteria for assessing the effects of sound on marine mammals and fish are summarised in Table 3.3. The physiological damage criteria for marine mammals refer to those contained in Table 3.1.

Species	No effect	Mild behavioural disturbance	Strong behavioural disturbance	Physiological damage
Marine Mammals	No detectable change in ambient noise level	rms sound pressure level more than 140 dB re 1 µPa	rms sound pressure level more than 160 dB re 1 µPa	Exceeds Southall criteria for PTS
Fish	No detectable change in ambient noise level	75 dB_{ht} above species specific threshold of hearing	90 dB_{ht} above species specific threshold of hearing	Peak to peak sound pressure level more than 240 dB re 1 µPa

Table 3.3 Suggested criteria for assessing effects of sound on marine mammals and fish

4 REVIEW OF 'HYWIND I' UNDERWATER NOISE DATA

Statoil commissioned Fugro GEOS and Jasco Applied Sciences to undertake underwater noise measurements in the vicinity of the Hywind I installation at a test site north-west of Stavanger, Norway. The purpose of the measurement exercise was to quantify potential underwater noise emissions from the Hywind turbines during operation in order to inform any impact assessments that will be required for the Hywind project sites.

Measurements were undertaken at a test location some 150 m from the main structure and the hydrophone was deployed at a depth of 91 m. Additional background noise level readings were undertaken at a remote control site with comparable natural environmental conditions, 10 km from the Hywind test site. The relative locations of the test site and control site are shown in Figure 4.1.

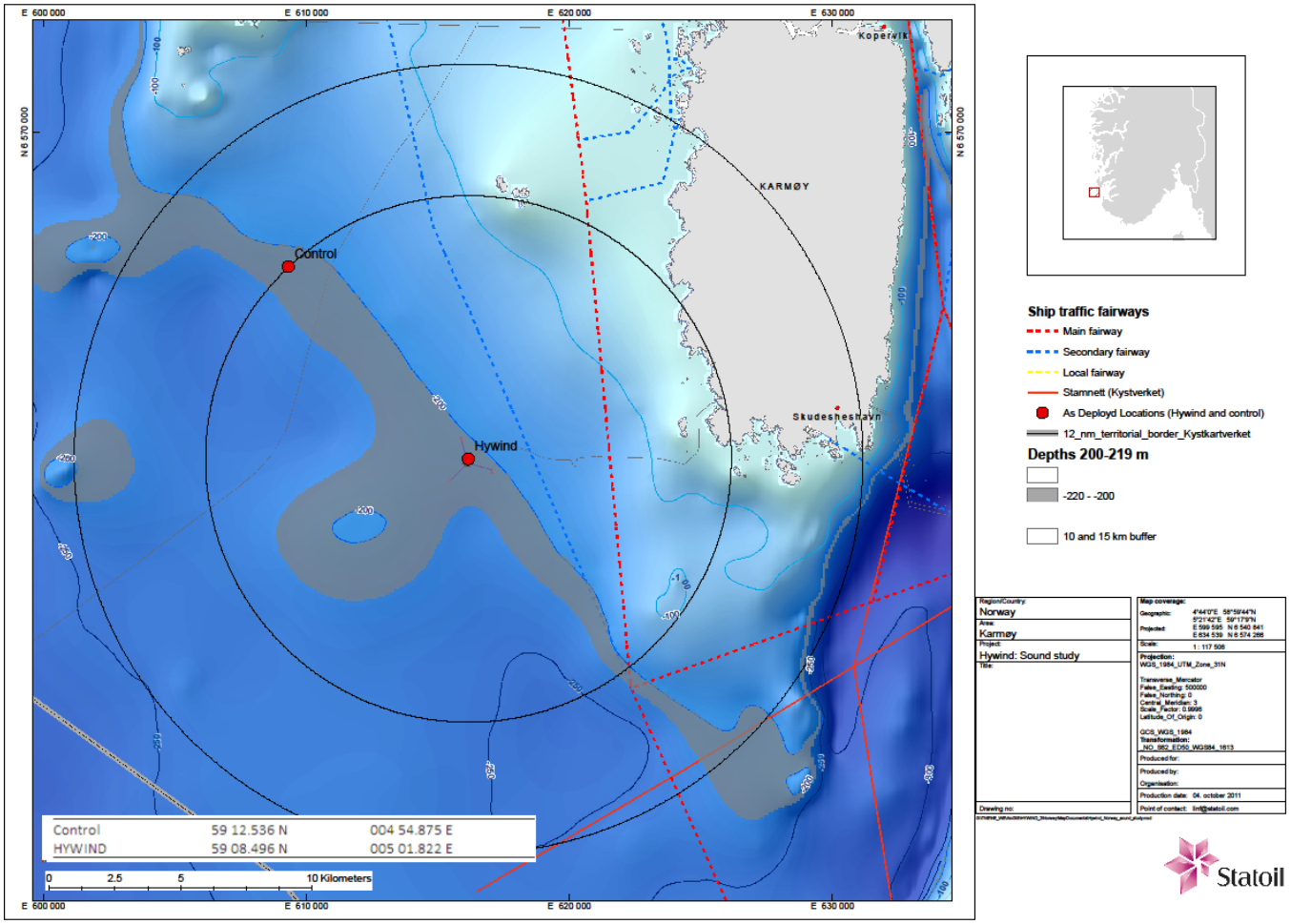

Figure 4.1 Location of the recording hydrophones for Hywind and Control.

The recording equipment was first deployed on 28th March 2011 and recovered on 31st May 2011. The second deployment was on 31st May 2011 with recovery on 15th August 2011. A total of 148 days recording period was achieved during the project.

The study concluded that:

> The Hywind structure generates a variety of signature components that can be detected above the background noise level. These appear to be related to gear meshing and electrical generation. None of these components exhibited levels that exceeded a power spectral density (PSD) of 115 dB re 1 $\mu Pa^2 Hz^{-1}$.

> The Hywind structure produces occasional ‘snapping’ transients that have received peak levels (at a distance of 150 m) above 160 dB re 1 μPa. The frequency content of the transients extends throughout the recorded frequency range of 0 – 20 kHz. Between 0 and 23 of these transients occurred per day. These transients are thought to be related to tension releases in the mooring system.

5 FURTHER ANALYSIS RELATING TO HYWIND SCOTLAND

5.1 Tonal Sound from Operation

The operation of the turbine produced tonal noise at a frequency of 25 Hz and harmonics thereof. None of these components exhibited levels that exceeded a power spectral density (PSD) of 115 dB re 1 μPa^2Hz^{-1}. Xodus has performed some simple calculations to convert the PSD plots from the Jasco report into approximate sound pressure level data. PSD levels were converted to sound pressure by applying a frequency bandwidth related correction for the appropriate frequency bin (in this case third octave bands were used). This was then corrected for background noise using the data from the control monitoring point. This analysis shows that the broadband sound pressure level due to operational noise is approximately 119 dB re 1 μPa (rms) at the monitoring point, which was 150 m from the turbine. If it is assumed that the turbines produce a similar level of noise over a 24 hour period then the daily cumulative sound exposure level (SEL) would be 168 dB re 1 μPa^2s at 1 m

Assuming spherical radiation of sound from the turbine this would result in a "source" sound pressure level of 162 dB re 1 μPa (rms) at 1 m and a "source" SEL of 212 dB re 1 μPa^2s at 1 m.

This would imply a potential zone of disturbance for marine mammals of approximately 10 – 15 m radius around each turbine, which is unlikely to be significant. It is extremely unlikely that injury would occur, even for harbour porpoise (which would need to remain in a radius of a few metres of the turbine for an entire day in order for it to be exposed to a sound exposure level in excess of the injury criterion).

It should be noted that the above analysis is approximate at this time and is based on the Hywind I turbine (i.e. a single 2.3 MW turbine). The Hywind Scotland project is likely to be larger in scale (up to five turbines with a maximum installed capacity of 30 MW) and this will need to be taken into account as part of the EIA.

5.2 Snapping Sound

The snapping sound, which was attributed to the cables, produced a broadband peak sound pressure level of 160 dB re 1 μPa (peak) at 150 m. Associated 1 minute rms sound pressure levels at the time of these recordings were generally in the range 120 – 125 dB re 1 μPa (rms).

The Jasco report does not provide sufficient detail about the snapping sound to covert from peak sound pressure to rms sound pressure and SEL. For transient impulsive sounds, the rule of thumb of a 6 dB difference between peak pressure and rms sound pressure level (which applies to continuous sound) does not hold true. It is therefore necessary (in absence of more detailed data) to make some assumptions about the sound in order to derive estimates of these parameters, for comparison to the various criteria for injury and disturbance.

The snapping sounds are impulsive in nature and it can therefore been assumed that the relationship between the various parameters will be similar to piling noise, which is also impulsive in nature and for which there is a good range of data available. Assuming a T90 time (i.e. the interval which contains 90% of the sound energy) of approximately 0.1 s, it is considered likely that the rms sound pressure level will be approximately 15 dB less than the peak sound pressure level. This would mean that the rms sound pressure level at 150 m would be around 145 dB re 1 μPa (rms) and the SEL per "snap" would be around 135 dB re 1 μPa^2s.

It is difficult to estimate the sound source level at 1 m due to the physical size of the ropes and chains. The large spread of the chain footprint means that the range from the source to the hydrophone is unknown and it is unlikely that the propagation can be treated as simply spherical spreading of sound.

The snapping events were found to occur up to 23 times per day for a single turbine. Assuming that multiple turbines could cause snapping sounds at the same rate under similar conditions, this could mean up to 140 snapping events per day (assuming 6 turbines). It is not possible at this time to predict the regularity and temporal spacing of such events. Nevertheless, a simple calculation shows that the potential cumulative SEL over a 24 hour period would be around 157 dB re 1 μPa^2s at 150 m from the turbine. This is well below the onset criteria for injury to marine mammals. It is possible that the peak pressure level could exceed the injury criteria for harbour porpoise at very close range, although further analysis will be required to determine how likely this is to occur.

In terms of disturbance, it is estimated that the 140 dB re 1 μPa (rms) criterion for mild behavioural disturbance would be exceeded at a range of up to approximately 250 m from each turbine, although this is a ballpark figure at this time. The potential disturbance zone is unlikely to overlap spatially between the turbines given the proposed turbine spacing of up to 1 km. It should be noted that the snapping sound will not occur with a known regularity and are unlikely to occur for all turbines at the same time. It is therefore difficult to estimate the cumulative effect of multiple turbines. These issues will need to be considered in more detail for the EIA.

It must be emphasised that the above analysis is very approximate at this time due to the various unknown quantities and potential errors involved (unknown propagation correction, unknown rms to peak correction, unknown T90 time). It is therefore recommend that additional data analysis is undertaken including inspection of the time series to derive rms(T90) and SEL levels for snapping events.

It is understood that there are potential mitigation measures being investigated to reduce or eliminate the chain snapping sounds. This includes investigating the use of rubber coatings over the chains and use of fibre ropes as an alternative.

5.3 Construction and Installation

There is potential for installation vessels and other equipment to produce noise during installation of the anchors, anchor lines, turbines and power cables. This includes use of vessels (especially if DP is required), seabed survey (e.g. sub bottom surveys) and potentially seabed preparation equipment, including use of equipment such as long baseline transponders if required.

If DP vessels are used, there is potential that the zone for disturbance to marine mammals could extend over several kilometres, but these will be temporary noise sources. It should be noted that there is considerable variation in noise signature and levels between different vessels and even for different operating conditions. Whilst it is possible to try to utilise quieter vessels for installation, experience shows that underwater noise data is not available for many survey and installation vessels.

It will be important to ensure that all construction and installation noise sources are taken into account in the EIA.

6 DATA REQUEST

In order to inform further analysis that will be required for the EIA the following additional data will be required.

6.1 Operational Noise Data Request

It will be important to obtain additional information and analysis relating to the snapping sound. The following information is requested:

- Time history data for the snapping events (preferably in numerical text format);
- Estimates of T90 times for the snapping events;
- $Rms_{(T90)}$ sound pressure levels for the snapping events;
- SELs for the snapping events, preferably presented in third-octave bands.

6.2 Construction and Assembly Noise Data Request

The following information is requested for the construction noise assessment:

- Construction and installation methodology;
- Construction and installation schedule;
- Details of potential vessels to be used including requirements for DP/thrusters;
- Details for any other sources of marine sound, such as transponders, seabed preparation etc.

It may also be necessary to assess the effects of airborne sound on marine mammals (e.g. otters, pinnipeds) and birds, especially for any cable landfall / pull ashore operations, if required. Airborne noise data for any equipment operating onshore or near-shore should therefore also be provided.

7 CONCLUSIONS

This report has presented an initial high level overview of potential impacts due to underwater noise during the construction and operation of the Hywind Scotland pilot park. In particular, this report reviews the underwater noise measurements and analysis previously undertaken by Statoil on the Hywind I demonstration unit to assess operational noise from the turbines and makes recommendations for how these should be covered as part of the EIA in terms of marine noise. It is concluded that:

- The potential zone of disturbance for marine mammals due to continuous operational noise is estimated to be approximately 10 – 15 m radius around each turbine (assuming a 2.3 MW turbine), which is unlikely to be significant.
- It is extremely unlikely that injury would occur for any marine mammals as a result of the continuous sound.
- The snapping sounds are impulsive in nature and, assuming that multiple turbines could cause snapping sounds at the same rate under similar conditions, this could mean up to 140 snapping events per day (assuming 6 turbines).
- There is a lack of data presented in the reports for the Hywind I noise surveys regarding the snapping sound, resulting in considerable uncertainty in assessing the potential for these sounds to affect marine wildlife. Based on the information available, it is considered unlikely that the SEL criteria for injury to marine mammals will be exceeded, although there is a possibility that the peak pressure level criteria could be exceeded at very close range.
- In terms of disturbance, it is estimated that the criterion for mild behavioural disturbance would be exceeded at a range of up to approximately 250 m from each turbine, although this is a ballpark figure at this time.
- The potential disturbance zone is unlikely to overlap spatially between the turbines given the proposed turbine spacing of up to 1 km and the snapping sound is unlikely to occur for all turbines at the same time.
- There is potential for installation vessels and other equipment to produce noise during installation of the anchors, anchor lines, turbines and power cables. This includes use of vessels (especially if DP is required), seabed survey (e.g. sub bottom surveys) and potentially seabed preparation equipment, including use of equipment such as long baseline transponders if required.
- If DP vessels are used, there is potential that the zone for disturbance to marine mammals could extend over several kilometres, but these will be temporary noise sources.
- A data request has been provided to allow analysis of the above issues as part of the EIA.

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