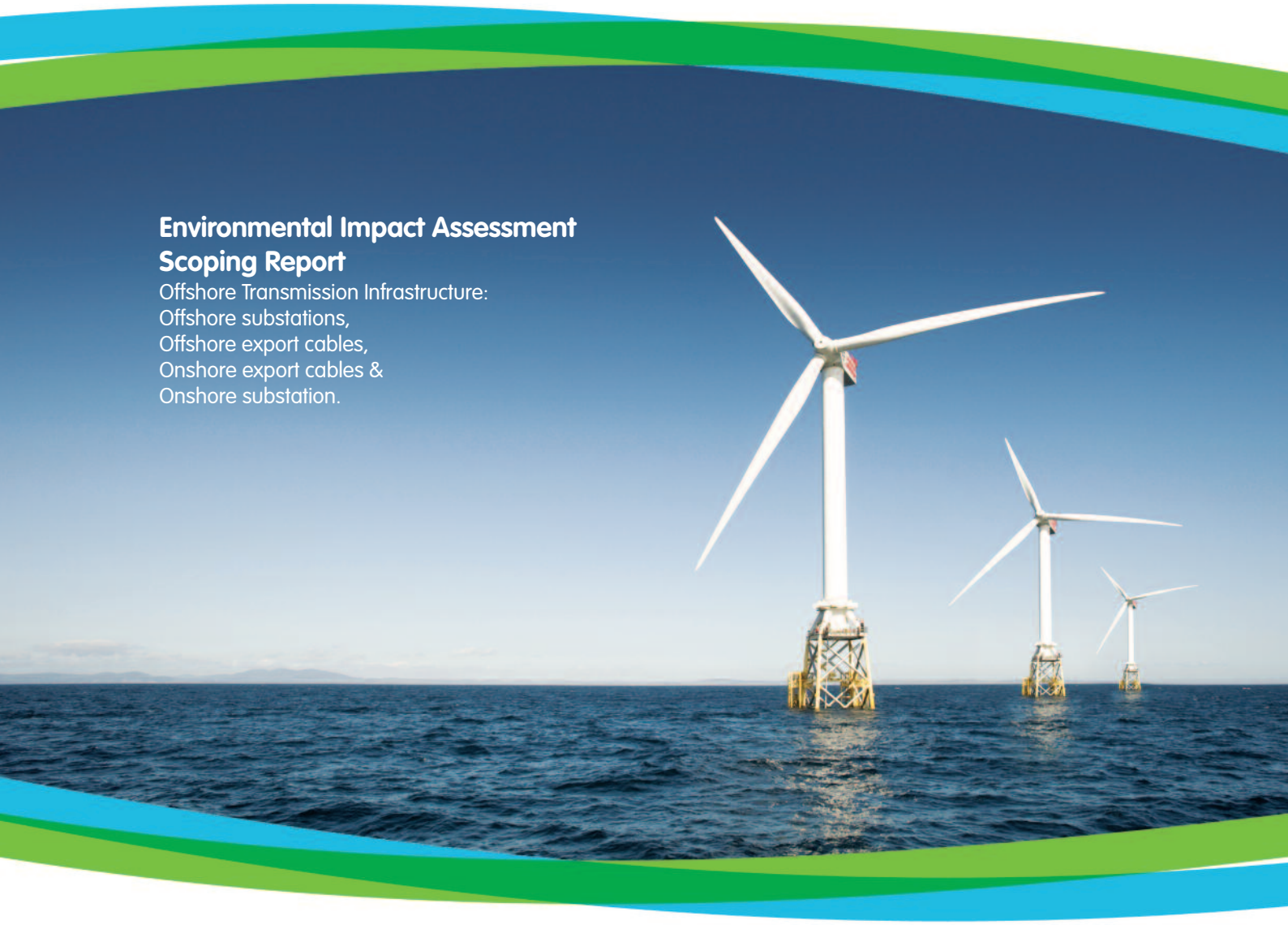
moray offshore renewables ltd

Developing Wind Energy In The Outer Moray Firth

Environmental Impact Assessment
Scoping Report
Offshore Transmission Infrastructure:
Offshore substations,
Offshore export cables,
Onshore export cables &
Onshore substation.



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Executive Summary

EDP Renováveis (EDP) and Repsol Nuevas Energias UK (formerly Sea Energy Renewables Limited) formed the joint venture known as Moray Offshore Renewables Limited (MORL)and entered into a Zone Development Agreement with the Crown Estate covering Zone 1 of the nine offshore wind farm zones which were awarded on 8th of January 2011. Zone 1 is located in the outer Moray Firth, within the UK Renewable Energy Zone (REZ).

MORL is developing the zone in two phases; the Eastern Development Area which went to scoping in August 2010 (MORL, 2010) and for which consent applications will be submitted in Q2/Q3 2012 and the Western Development Area, for which the Environmental Impact Assessment process is expected to commence in 2012.

MORL has been given a grid connection for 1.5 GW at Peterhead Power Station, which is owned and operated by Scottish and Southern Energy. An Offshore Transmission Owner (OFTO) will manage the offshore transmission infrastructure that is required to connect the wind farm to the National Grid at Peterhead. However, MORL will carry out the relevant studies to support the planning application of the OFTO infrastructure and is currently considering whether to undertake the generator build option for the offshore transmission infrastructure. This scoping report will focus on the offshore transmission infrastructure required, consisting of an offshore substation/converted station, offshore export cables, onshore export cables and onshore substation.

This scoping report has two purposes:

1. To gather further information on constraints to siting the OFTO infrastructure; and
2. To seek the opinion of statutory and non-statutory consultees on the scope of the Environmental Impact Assessment (EIA) which will be submitted to support the application for the consents required for the construction and operation of such infrastructure.

This scoping report presents detail regarding the baseline environment in and around the proposed offshore transmission infrastructure development area. This report also identifies potential impacts that may arise as a result of this development, directly, cumulatively and in combination with other developments. Studies and surveys are proposed in order to inform the EIA process and preliminary discussion on potential mitigation and monitoring measured is included.

Acknowledgements

Moray Offshore Renewables Limited would like to thank the following people/organisations for their assistance and contributions to the preparations of this scoping report:

- ABP Marine Environment Research Limited
- Anatec Ltd
- Brown & May Marine Limited
- EMU Limited
- Headland Archaeology
- Natural Power Consultants
- Optimised Environments
- RPS
- Subacoustech Environmental Limited

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Glossary

ADCP	Acoustic Doppler Current Profiler
AIS	Automatic Identification System
BGS	British Geological Society
BOWL	Beatrice Offshore Wind Limited
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
COWRIE	Collaboration for Offshore Wind Research in the Environment
CPOD	Cetacean Purpose Detector
CPT	Cone Penetration Test
DDV	Drop Down Video
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DTI	Department of Trade and Industry
EC	European Commission
EDPR	EDP Renováveis
EHO	Environment Heath Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPS	European Protected Species
ES	Environmental Statement
FIR	Fisheries Industry Representative
GBS	Gravity Base Substructure
GIS	Geographical Information System
GLA	General Lighthouse Authority
GPS	Geographical Positioning System
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
ICES	International Council for Exploration of the Sea
IHO	International Hydrographic Organisation
JNAPC	Joint Nautical Archaeology Policy Committee
JNCC	Joint Nature Conservation Committee
LBAP	Local biodiversity Action Plan
LNR	Local Nature Reserve
LSE	Likely Significant Effect
MCA	Maritime and Coastguard Agency
MDS	Multidimensional Scaling
MESH	Marine European Seabed Habitats
MFOWDG	Moray Firth Offshore Wind Dev elopers Group
MoD	Ministry of Defence
MORL	Moray Offshore Renewables Limited
MSS	Marine Scotland Science
NPF	National Planning Framework
NTS	Non Technical Summary
NVC	National Vegetation Classification

OFGEM	Office of the Gas and Electricity Markets
OFTO	Offshore Transmission Owner
OWF	Offshore Wind Farm
PAN	Planning Advice Note
PIA	Personal Injury Accident
PMF	Priority Marine Features
PSD	Particle Size Distribution
R3	Round 3 Offshore Wind Farm Developments
REZ	Renewable Energy Zone
RIGS	Regionally Important Geological/Geomorphological Sites
ROS	Registers of Scotland
SAC	Special Areas of Conservation
SBL	Scottish Biodiversity List
SCADA	Supervisory Control and Data Acquisition
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SERL	Sea Energy Renewables Limited
SFF	Scottish Fishermen's Federation
SLVIA	Seascape, Landscape and Visual Impact Assessment
SMRU	Sea Mammal Research Unit (University of Aberdeen)
SNH	Scottish Natural Heritage
SPA	Special Protection Areas
SPP	Scottish Planning Policy
SPV	Special Purpose Vehicle
SSC	Suspended Sediment Concentrations
SSE	Scottish and Southern Energy
SSSI	Sites of Special Scientific Interest
STW	Scottish Territorial Waters
SUT	Society for Underwater Technology
UKBAP	UK Biodiversity Action Plan
UKHO	United Kingdom Hydrographic Office
VMS	Vessel Monitoring System

1 Introduction

Moray Offshore Renewables Limited (MORL) entered into a Zone Development Agreement with the Crown Estate to develop Zone 1 of the nine UK Round 3 offshore wind farm zones. Zone 1 is located in the outer Moray Firth within the UK Renewable Energy Zone (REZ) (Figure 1-1).

Using a zonal constraints analysis MORL has identified two potential development areas (Figure 1-2). The eastern development area is currently considered to have the higher potential for development and is being progressed first. It is anticipated that 1-1.14 GW of power capacity will be developed in this area. The western development area will be progressed from 2012. It is anticipated to have a development capacity of 360-500 MW.

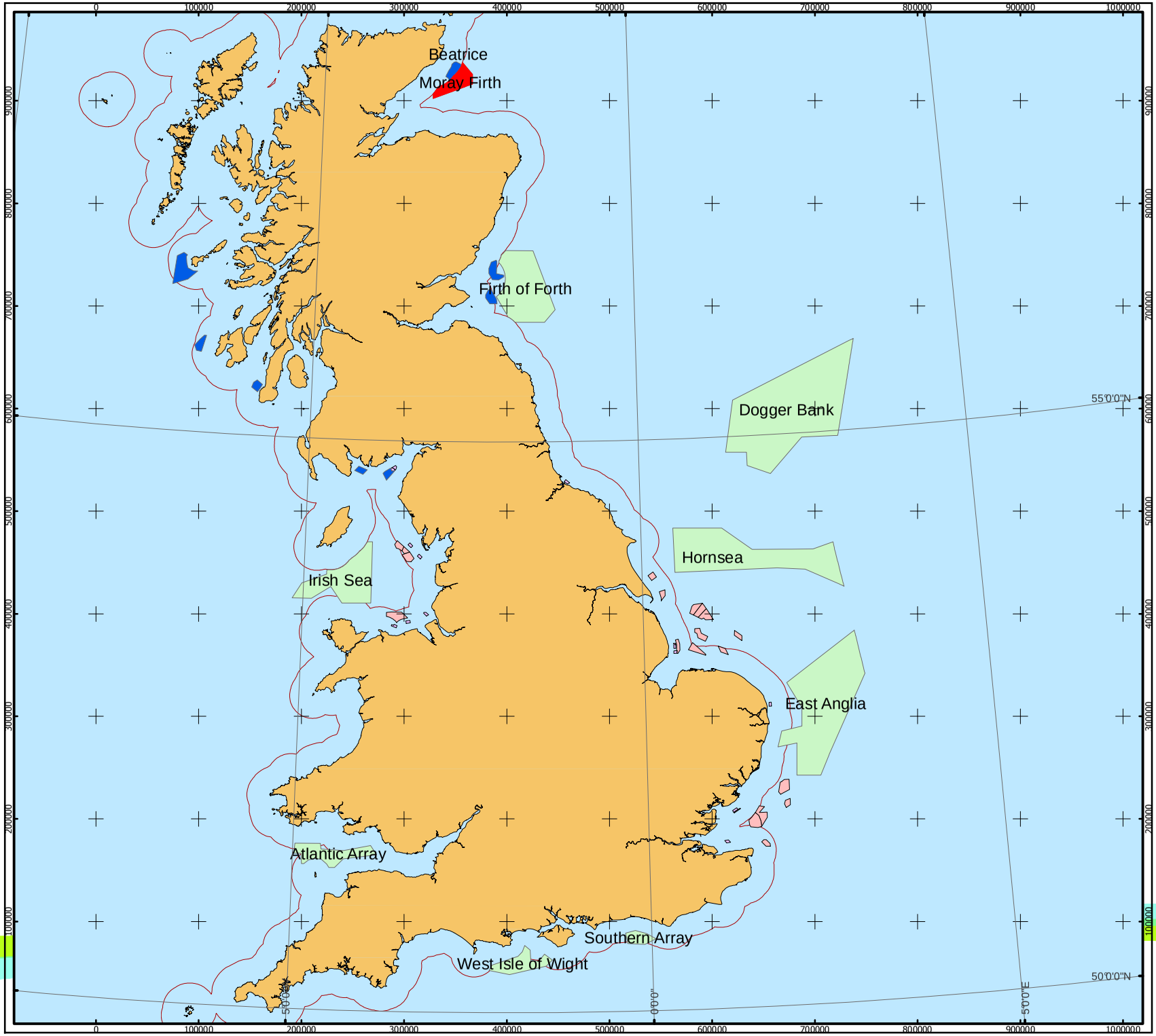
MORL has been given a connection to the grid at Peterhead Power Station owned and operated by Scottish and Southern Energy (SSE), located just south of Peterhead (Figure 1-2). An Offshore Transmission Owner (OFTO) will manage the offshore transmission infrastructure that is required to connect the wind farm to the National Grid; nevertheless MORL is carrying out the relevant studies to support the required application(s) for a Town & Country Planning Permission and Marine License. MORL is also considering whether to undertake the generator build of the offshore transmission infrastructure (see section 1.3). The offshore transmission infrastructure will transmit the energy produced from the first and second phases of MORL's development (i.e. eastern and western development areas) to the national grid (up to 1.5 GW).

A separate scoping document detailing the Eastern Development Area offshore wind farm infrastructure proposal (i.e. wind turbines, substations and interarray cables) was produced in August 2010 (MORL, 2010). In addition, MORL has not yet selected any ports or harbours for construction or operation and maintenance work and these are not covered in this document. **Therefore, this scoping document relates to the works associated with the offshore transmission infrastructure only.**

The initial study of the offshore transmission infrastructure covered a wide area, both offshore and onshore. A series of studies were undertaken in order to select a preferred route to connect the offshore substation to the onshore substation (situated as close as possible to the connection point). The iteration process is described in section 2.2.1.

The purpose of this scoping report is to seek the opinion of the statutory and non-statutory consultees on the proposed scope of the Environmental Impact Assessment (EIA) relating to the offshore transmission infrastructure, which will be submitted to support the application for the consents required for the development of the offshore and onshore export cables and offshore and onshore substations. A similar exercise has been undertaken for the offshore generating station as described above (MORL, 2010).

Scoping is an early stage of the environmental assessment process and is designed to ensure that the environmental studies undertaken provide all the relevant information required for the assessment. Scoping is the process for determining the content and extent of the matters which should be covered in the environmental information to be submitted to a competent authority for projects with are subject to EIA. The scoping process is designed for consultees to input into the EIA process for a particular project.



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REPSOL

Moray Offshore Renewables Ltd

KEY

- 12nm Buffer
- Moray Offshore Wind Farm (R3)
- Round 3 Zones
- Round 2 Zone
- Round 1 Zone
- Scottish Territorial Waters

Horizontal Scale: 1:5.000.000 A4 Chart

0 50.000 100.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

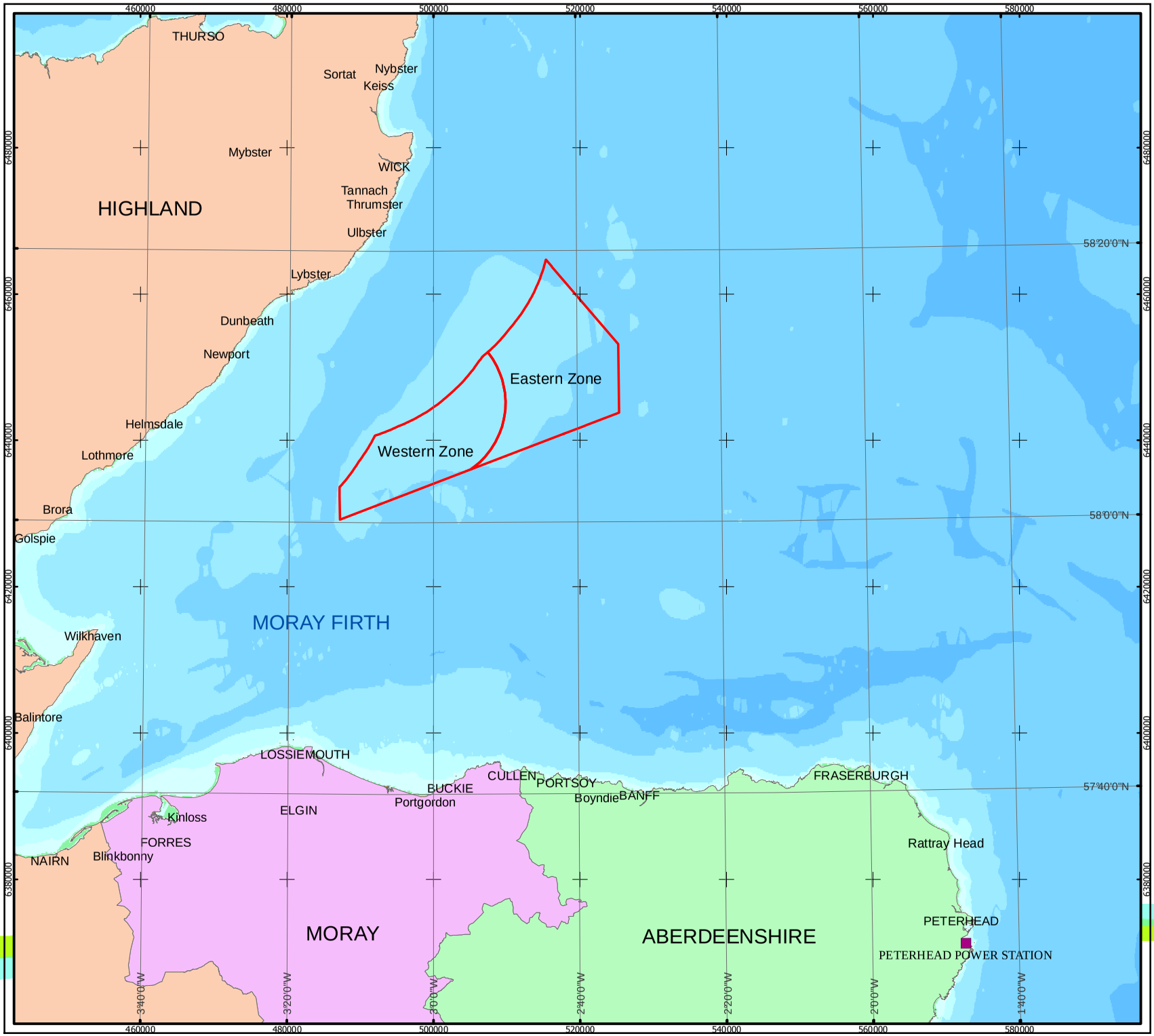
Produced: RH
Reviewed: CR
Approved: CR

Date: 21/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-001

Fig:1-1 Round 3 Zones

Moray Offshore Renewables Ltd



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REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary

Bathymetry (m)

- >10000
- <=10000
- <=5000
- <=1000
- <=500
- <=100
- <=50
- <=20
- <=10
- >=0

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 10/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-002

Fig:1-2 MORL Development Areas & Grid Connection Point

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This scoping report provides details of the proposed development area along with baseline environmental information currently available. The potential impacts of the development have been identified, along with cumulative and in-combination impacts, following which the further assessment required for the EIA has been presented and an outline scope of works provided.

The results of the EIA stage will be published in the Environmental Statement (ES). A single ES will be produced to cover both the offshore generating station (Eastern Development Area) and offshore transmission infrastructure. The fundamental purpose of the Environmental Statement (ES) will be to demonstrate that:

a) The proposed wind farm sites (offshore generating station), offshore and onshore export cable routes and offshore and onshore substation areas (offshore transmission infrastructure) have been selected to minimise environmental impacts and conflicts of interest, where possible.
b) The scheme has been designed to mitigate any potential adverse impacts as far as reasonably possible.

The final ES will clearly inform stakeholders of the residual impacts and facilitate informed consent decisions.

1.1 THE DEVELOPERS APPLYING FOR CONSENTS

Moray Offshore Renewables Limited (MORL) is a special purpose vehicle (SPV) established by EDP Renováveis (EDPR) and SeaEnergy Renewables Ltd. In June 2011, SeaEnergy Renewables Ltd was acquired by Repsol Nuevas Energias UK. Moray Offshore Renewables Ltd is now owned 67 per cent by EDPR and 33 per cent by Repsol Nuevas Energias UK.

The purpose of MORL is to develop, consent, finance, construct, operate and maintain over the lifetime offshore wind sites within the Moray Firth Round 3 zone. MORL intends to apply for the consents required for the offshore transmission infrastructure, but these assets will be transferred to an OFTO for operation and decommissioning (see section 1.3 for information on legislation). MORL has yet to decide whether the appointed OFTO or MORL will construct the offshore transmission infrastructure.

1.2 THE NEED FOR THE DEVELOPMENT

MORL's proposed offshore wind farm development will produce electricity from a renewable energy source. This renewable energy will be transferred to the National Grid through the Offshore Transmission Infrastructure. The need for the development is explained through a series of International and National Policies, as summarised below.

The introduction of the Climate Change Act (2008) committed the UK to a legally binding target of at least 34% reduction by 2020 and at least an 80% cut in greenhouse gas emissions by 2050. The Climate Change (Scotland) Act (2009) committed Scotland to cut emissions by 42% by 2020 and 80% by 2050. These targets meet and exceed European agreements of which the UK is subject. As part of the Renewable Energy Strategy for the UK, the Government has set national targets for >30% of electricity to be generated from renewables (DECC, 2009a). The Scottish Government has recently

set a target of "generating the equivalent of 100% of Scotland's own electricity demand from renewable resources by 2020" with the First Minister stating that "Offshore wind will play a key role in achieving our ambitions" (Scottish Government, 2011).

Wind energy is a means of generating electricity without producing significant airborne or waterborne toxic emissions, and is not dependant on finite reserves of fossil fuels. It is ultimately a sustainable and proven technology, a fact that is recognised the UK Government approach to the wind development. Previously the UK government has released areas for offshore wind development in 'rounds', similar to of its approach to offshore oil and gas development. To date there have been three UK wide rounds of offshore wind development in the UK, administered by the Crown Estate. As of June 2011[1] the UK had an installed offshore wind generation capacity of 1,341.20 MW, with a further 2,238.00 MW under construction and 1,808.10 MW consented under Round 1 and 2 releases.

1.3 REGULATORY AND POLICY BACKGROUND

Under the provisions of the Energy Act 2004, operation of an offshore transmission system became a licensable activity. In keeping with EC unbundling legislation, it is not permissible for a developer to hold both a generation and transmission license (except under very exceptional circumstances). The consequence of this is that MORL cannot retain operational control of any OFTO assets. It is, however, permissible for MORL to construct and install OFTO assets prior to them becoming operational. Exercising such a choice is deemed as the generator build option. At this time no decision has been made in relation to MORL opting for a generator build option. MORL can consent on behalf of an OFTO provided all such agreements, wayleaves and consents are transferable prior to the OFTO system being deemed operational by the authority.

MORL is therefore currently acting as an 'interim OFTO' and is carrying out all relevant onshore surveys and offshore surveys, in order to support the EIA and obtain the relevant consents and licences for the OFTO infrastructure. However there is currently some uncertainty regarding the implementation of the OFTO process and the consenting strategy allows flexibility in the OFTO entrance window. As such the extent to which MORL will conduct work on behalf of the yet-to-be-appointed OFTO is not currently confirmed.

There is no single consent which provides permission to construct infrastructure which spans offshore and onshore terrain. The construction of onshore (i.e. above mean low water springs) ancillary infrastructure requires consent under The Town and Country Planning (Scotland) Act 1997. This consent can either be applied for as a separate Town & Country Planning Permission submitted to the relevant Local Planning Authority or in some cases can be applied for as a deemed consent as part of the Section 36 application.

MORL's consenting strategy has not been decided and therefore both options are still being considered. This decision will be influenced by the emerging regime for appointment of an OFTO and will be made later in the project.

[1] www.bwea.com/statistics accessed on 16 June 2011.

The relevant policy and legislation for both options is described below.

THE TOWN AND COUNTRY PLANNING (SCOTLAND) ACT 1997

A Town & Country Planning Permission application would be required from Aberdeenshire Council for OFTO onshore works, should MORL decide on this consenting route. Otherwise, MORL would apply for a deemed Town and Country Planning Permission under the Electricity Act 1989.

A series planning guidelines are available in Scotland through National Planning Framework (NPF), Scottish Planning Policy (SPP), Planning Advice Notes (PANs) and Planning Circulars. These policies are further supported by Local Development Plans, comprising Structure Plans and Local Plans.

The Aberdeen City and Shire Structure Plan (Aberdeen City Council & Aberdeenshire Council, 2009) and the Aberdeenshire Local Plan (Aberdeenshire Council, 2006) are of relevance for this development and the entire proposed onshore works lie within Aberdeenshire Council (Northeast area). Both plans support the principle of renewable energy developments provided they comply with the provisions of local planning policy.

REQUIREMENT FOR AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The EC Directive 85/337/EEC as amended by Directive 97/11/EC (the EIA Directive) requires certain developments to be subject to EIA. The purpose of the Directive is to ensure that, in considering whether to grant consents for developments that are likely to have significant environmental effects, the consenting authorities have all the necessary environmental information on which to base their decision.

Under The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011, the onshore substation is classified as a Schedule 2 development (given its development area) and therefore requires an EIA. The export cables (onshore and offshore) and offshore substation will also be included in the EIA for the transmission infrastructure as they are considered to be part of the same project.

There is also a requirement to consider cumulative and in-combination impacts as part of the EIA process. Projects to be included in such an assessment must include existing projects and those currently in the planning system. Projects to be included in such an assessment must include not only other potential renewable energy projects but also other types of project taking place in the marine/coastal and terrestrial environment.

MARINE LICENSE

Under the Marine Bill (Scotland) 2010, the requirement for a Marine License was introduced. In effect, this replaces the requirement for a consent under section 5 of the Food and Environmental Protection Act (1985) (for the deposit of objects on the seabed below mean high water springs) and a consent under section 34 of the Coast Protection Act (1949) (for the deposit of objects which may endanger the safety of navigation). The primary objectives of the legislation are to protect both the marine ecosystem and human health and to minimise interference and nuisance to other legitimate users of the sea. The Marine Licensing regime (Marine (Scotland) Act 2010, Part IV Marine Licensing) has recently been implemented (6 April 2011). A Marine Licence would be sought by MORL for the development of the offshore substation and offshore export cables.

THE CROWN ESTATE ACT 1961

The Crown Estate, as the main landowner of the seabed, requires a lease to be granted for developments on the marine estate, including cable laying and construction of the offshore substation. A lease will be granted when all the consents for the project have been obtained. Rights of Occupation are granted by The Crown Estate Commissioners under Section 3 of The Crown Estate Act 1961 for the purpose of placing structures on or passing cables over the seabed or foreshore. This is a statutory consent granted in the form of a lease.

HABITATS AND BIRDS DIRECTIVE: REQUIREMENT FOR APPROPRIATE ASSESSMENT

The Habitats Directive was transposed into UK Law by the Conservation (Natural Habitats &c) Regulations 1994, as amended (Habitat Regulations). This requires a Habitats Regulation Assessment to be conducted by the 'competent authority' before a plan or project that is likely to have a significant effect on designated or candidate Special Protection Areas (SPA) or Special Areas of Conservation (SAC), can be given consent, permission or other authorisation. The UK SACs and SPAs form the Natura 2000 network, which is at the core of the Habitats Directive.

EUROPEAN PROTECTED SPECIES

Annex IV of the Habitats Directive lists certain species of European Community interest which are in need of strict protection. Any of these species whose natural range includes any area in Great Britain are called 'European Protected Species'. Their places of shelter are fully protected and it is an offence to damage, destroy or obstruct access to or otherwise deny the animal use of a breeding or resting site, whether deliberately or not. It is also an offence to disturb in a manner that is, or in circumstances which are likely to significantly affect the local distribution or abundance of the species, disturb in a manner or circumstances which are likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

Licences may be given authorising activities involving European Protected Species of plants or animals which would otherwise be illegal under the Regulations. The licences are granted by Scottish Natural Heritage (SNH) or the Scottish Government depending on the reason for the license application.

THE WILDLIFE AND COUNTRYSIDE ACT 1981, SCHEDULE 1, 5 AND 8 SPECIES AND SITES OF SPECIAL SCIENTIFIC INTEREST

The Wildlife and Countryside Act provides for animals and plants, and sites identified for their flora and fauna, as follows:

Sites

The Act contains measures for the protection of Sites of Special Scientific Interest (SSSIs) protected for their flora and fauna.

Birds

The Act makes it an offence (subject to exceptions) to intentionally or recklessly kill, injure or take any wild bird; take, damage or destroy the nest of any wild bird while that nest is in use or being built; or take or destroy an egg of any wild bird. Special penalties are available for offences related to birds on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young.

Other Animals

The Act makes it an offence (subject to exceptions) to intentionally or recklessly kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places.

Plants

The Act makes it an offence (subject to exceptions) to intentionally pick, uproot or destroy any wild plant listed on Schedule 8, or any seed or spore attached to any such wild plant.

PROTECTION OF BADGERS ACT 1992

The Protection of Badgers Act makes it an offence to recklessly take, injure or kill a badger, or destroy or cause disturbance to its sett. Any sett within an active badger territory is afforded legal protection, whether it shows signs of recent use or not. In addition, badgers are afforded protection from cruel ill-treatment, which includes preventing a badger access to its sett, as well as causing the loss of significant foraging resources within a badger territory.

OTHER CONSENTS REQUIRED

The generating stations will be consented under Section 36 of the Electricity Act 1989 plus Marine License.

2 Project Description

This section provides a high level description of the proposals for the offshore transmission owner (OFTO) infrastructure required to connect the wind farms that will be developed by MORL to the pre-existing onshore National Electricity Transmission System (NETS). It should be noted that the OFTO infrastructure design process is at an early stage, and therefore many aspects of the design are yet to be finalised. The information contained in this report reflects the design envelope at the time of writing. There are three main elements to the OFTO infrastructure, these being the offshore platform structures accommodating those assets necessary for the collection and conversion of power from the individual wind turbine generators (WTGs), the offshore to onshore cables for the bulk transfer of power and the onshore assets necessary to facilitate the final connection to the pre-existing assets of the NETS.

2.1 OBJECTIVES OF THE OFTO DEVELOPMENT

The primary objective of the OFTO development is to collect the energy generated by the offshore wind turbine generators (WTGs) and provide a bulk transfer conduit to transmit the energy to the NETS interface point located onshore. The OFTO infrastructure is essential for the MORL wind farm projects whose objectives are the generation of energy from a renewable source, in line with the UK and Scottish Governments' targets of generating >30% and 100%, respectively, of electricity demand from renewable sources by 2020. The MORL projects will offset the emission of greenhouse gases, in line with the UK's commitments under the Kyoto Protocol (please see MORL's Eastern Development Scoping document for details on renewable energy targets and policies).

The provision of the OFTO infrastructure allied to the installation of WTGs within the proposed development area will make a significant contribution towards the reduction of harmful greenhouse gas emissions that could otherwise be generated from fossil fuel electricity generation.

2.2 OFTO ASSETS LOCATION

The OFTO infrastructure within the zones will comprise between three to six HVAC platforms and associated HVAC cabling. The offshore substation assets will mainly be located within the eastern development area, the export cable joins the substation to the onshore substation with the NETS at Peterhead. In addition to the HVAC infrastructure referenced above there is the potential for a further two HVDC offshore platform structures to be located out with the development zone south of the zone's southern boundary somewhere along the OFTO cable route to Peterhead.

2.2.1 OFFSHORE AND ONSHORE CABLE EXPORT ROUTE SELECTION AND OFFSHORE AND ONSHORE SUBSTATION LOCATIONS

In August 2010 MORL was offered a grid connection at Peterhead Power Station, approximately 88 km southeast of MORL's Eastern Development Area (Figure 1-2).

Following this connection offer, MORL commissioned an Export Cable Feasibility Study (Metoc-Hyder, 2011). This study was primarily desk-based (with site visits to the identified landfall points) which aimed at identifying options and assessing feasibility for 2 km route corridors for export cable (onshore and offshore), landfall points and onshore substation locations taking into account the

likely environmental issues and engineering and health and safety constraints. The onshore route also incorporated the Holford Rules for overhead lines, with adaptations for underground lines.

The study identified 13 offshore cable routes, 11 potential landfall points, and three primary onshore route corridors which diverged to connect with eight of the potential landfall points (the onshore corridor width for the study was 2 km, which meant all 11 landfall points were covered in the onshore corridor study) (Figures 2-1 & 2-2). These routes were ranked on environmental, engineering and economical issues and narrowed down in the assessment process to 8 landfall points and the route corridors were reduced down to a width of 500 m. These eight landfall points and associated onshore and offshore routes were then taken forward to a concept engineering study by JP Kenny (JP Kenny, 2011).

The subsequent iteration process for landfall point selection, offshore and onshore cable routes and onshore substation is described in the following sections. The selection criteria used include route length, engineering and health and safety constraints, physical and third party constraints and environmental and consenting constraints, as well as consultation with fisheries groups including the Scottish Fishermens' Federation (SFF) and the Inshore Fisheries Group (IFG).

LANDFALL SELECTION

As described above, eight out of the initial 11 landfall points identified within the Export Cable Feasibility Study were taken to the next stage of the concept engineering study.

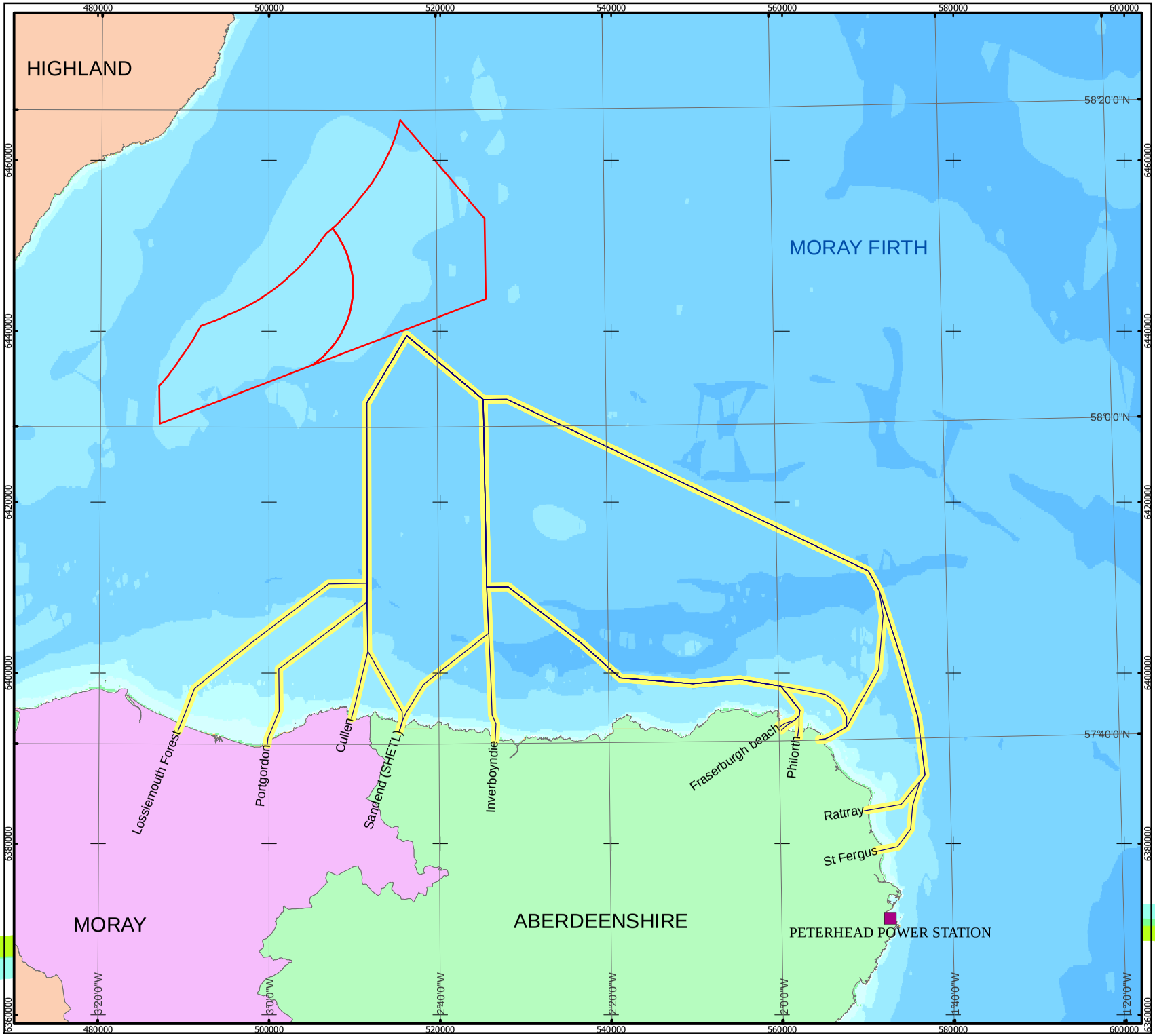
The concept engineering study identified four preferred landfall points, shown below by order of preference (JP Kenny, 2011) (Figure 2-3):

- Fraserburgh Beach;
- Rattray;
- Inverboyndie; and
- Sandend.

Overall, the two preferred landfalls were Fraserburgh Beach and Rattray. Fraserburgh Beach was considered the preferred option for engineering options, with minimal impact on third parties and the environment and with suitable offshore conditions. Furthermore, a route passing through this landfall would be one of the shortest overall

Rattray was selected as the second top preferred landfall point, mainly given its associated short onshore route.

Inverboyndie and Sandend were discounted for access and constructability issues.



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REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- METOC-Hyder Offshore Cable Route Initial Options
- METOC-Hyder Offshore Cable Route Corridor

Horizontal Scale: 1:600.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 13/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-003

Fig:2-1 Offshore Export Cable Corridors Metoc-Hyder

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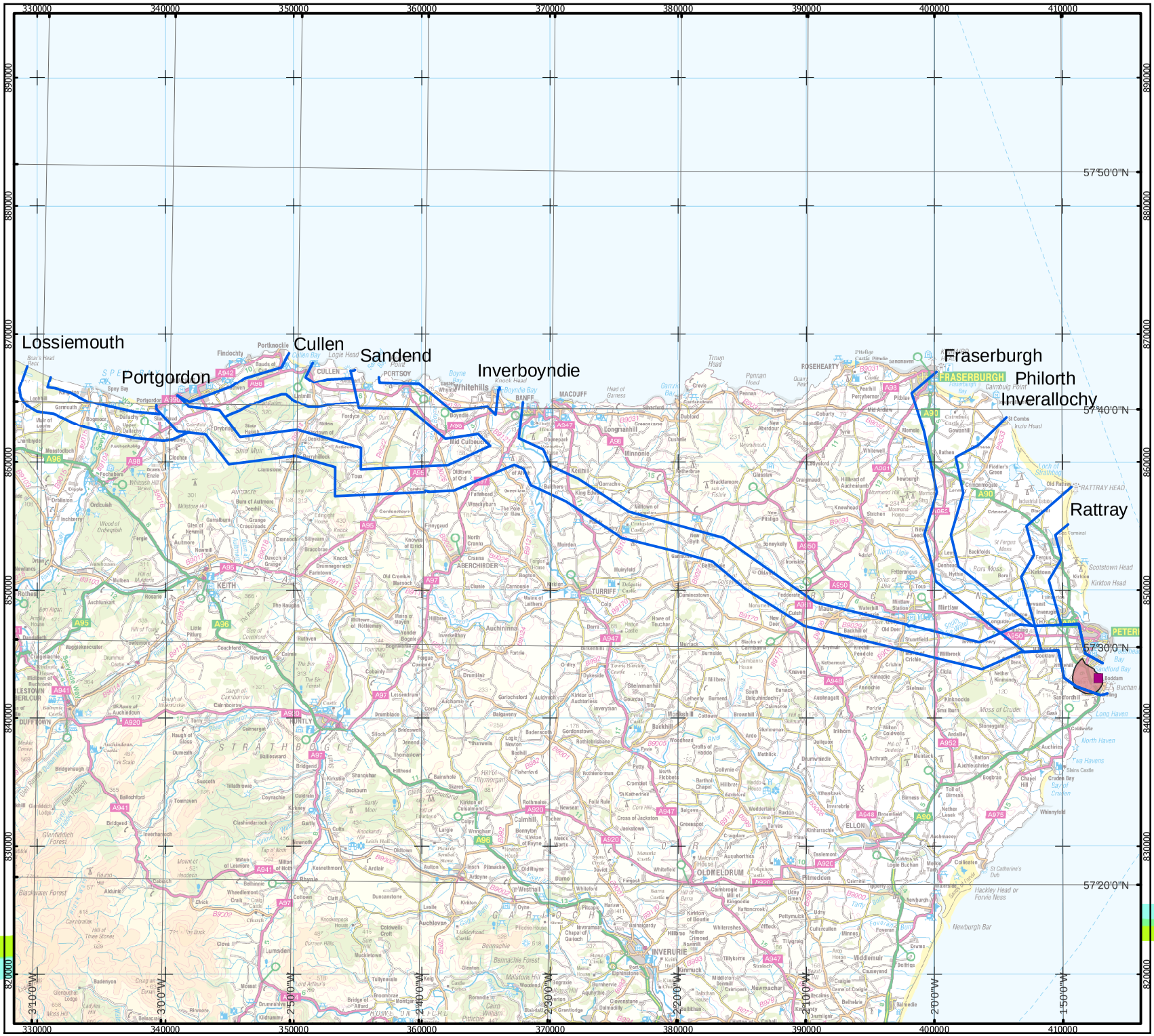

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REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- METOC-Hyder 2km Onshore Export Cable Corridors
- Onshore Substation Study Area

Horizontal Scale: 1:400.000 A4 Chart

0 5.000 10.000 Meters

N

Geodetic Parameters: British National Grid (OSGB36)

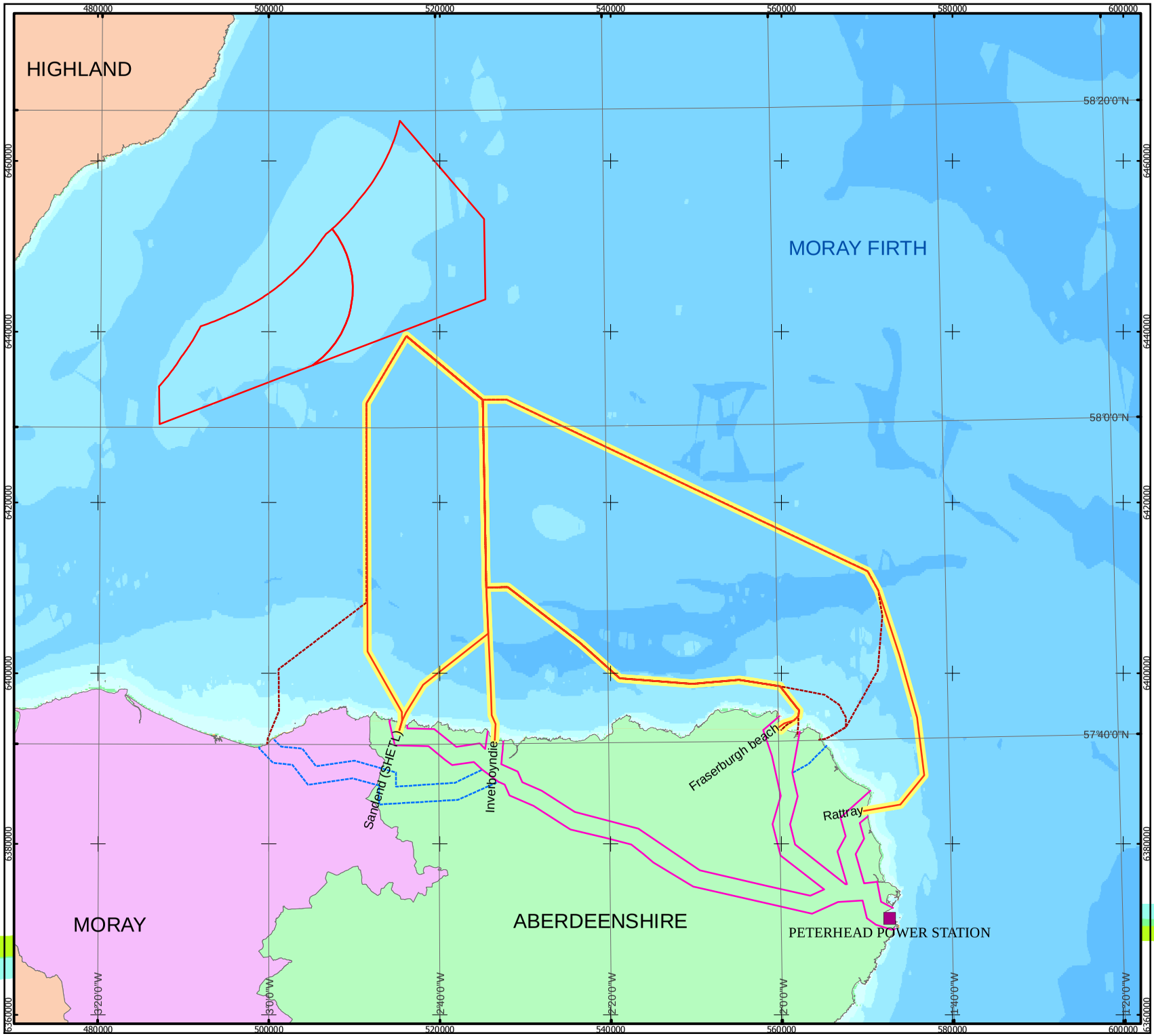
Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-004

Fig:2-2 Onshore Export Cable Corridors Metoc-Hyder

Moray Offshore Renewables Ltd



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REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- Offshore Cable Route - Landfall Points taken to 2nd Stage of Selection
- Offshore Cable Route - JP Kenny Preferred Landfall Points
- JP Kenny Preferred Offshore Cable Routes Corridors
- Onshore Cable Route - Route connections taken to 2nd Stage of Selection
- Onshore Cable Route - JP Kenny Preferred Routes

Horizontal Scale: 1:600.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 14/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-005

Fig:2-3 Onshore & Offshore Cable Routes - Stage 1 Concept Engineering Study

Moray Offshore Renewables Ltd

OFFSHORE EXPORT CABLE ROUTE

Out of the 11 offshore cable routes identified by the initial feasibility study undertaken by Metoc-Hyder (2011), only five were taken to the next stage of concept engineering studies (routes associated with the top four landfall points as described above). The study concluded that they would all meet engineering and construction requirements (JP Kenny, 2011).

The route options associated with the landfall points were then discussed with the MORL's Fisheries Industry Representatives (FIRs) and local creelers (creel fishing) during a consultation process. Recommendations based on potential impacts on commercial fisheries were made and considered within the final offshore route and landfall choices.

In addition to the routes described above, MORL also decided to include a route with the aim of a possible connection to the HVDC Hub (Figure 2-4). This HVDC hub is proposed by SHETL for the Outer Moray Firth, to the east of the Round 3 Zone 1 area, and could incorporate transmission from renewable energy projects across northern Scotland south to grid connection points at Blackhillock and Peterhead. This could include:

- Caithness onshore renewable;
- Shetland onshore renewable;
- MORL; and
- BOWL.

It should be noted that this route (if it became feasible) would require a Marine License and would not require a Town and Country Planning Permission.

ONSHORE EXPORT CABLE ROUTE

The four routes associated with the top four landfall points identified during the Export Cable Feasibility Study (Metoc-Hyder, 2011) were also deemed to satisfy all routing constraints and meeting engineering and health and safety operational and construction requirements during the concept engineering study (JPKenny, 2011).

The onshore routes associated with the two preferred landfall points (Fraserburgh Beach and Rattray) are currently being surveyed.

OFFSHORE SUBSTATION LOCATION

The design of the OFTO offshore electrical infrastructure is at an early stage. In order to provide the required level of detail on the project that will be required for the EIA, options are currently being considered by MORL for all of the key components, including finalising the type, number and location of offshore substation platforms.

An indicative drawing representing the worst case scenario, six HVAC and two HVDC offshore platforms, has been provided to illustrate the OFTO assets more clearly. It's envisaged that any HVDC assets located outwith the zone will be as close as practicable to the zone boundary (see Figure 2-5)

ONSHORE SUBSTATION LOCATION

One substation and one HVDC converter station (if HVDC option), covering an area of approximately 100 x 120 m and 100 x 100 m respectively, will be required in the vicinity of the connection point at Peterhead (Metoc-Hyder, 2011 & JP Kenny, 2011). The currently selected area for possible

installation of the onshore substations is shown in Figure 2-5. MORL is currently undertaking land negotiations, and the exact substation location is still to be defined.

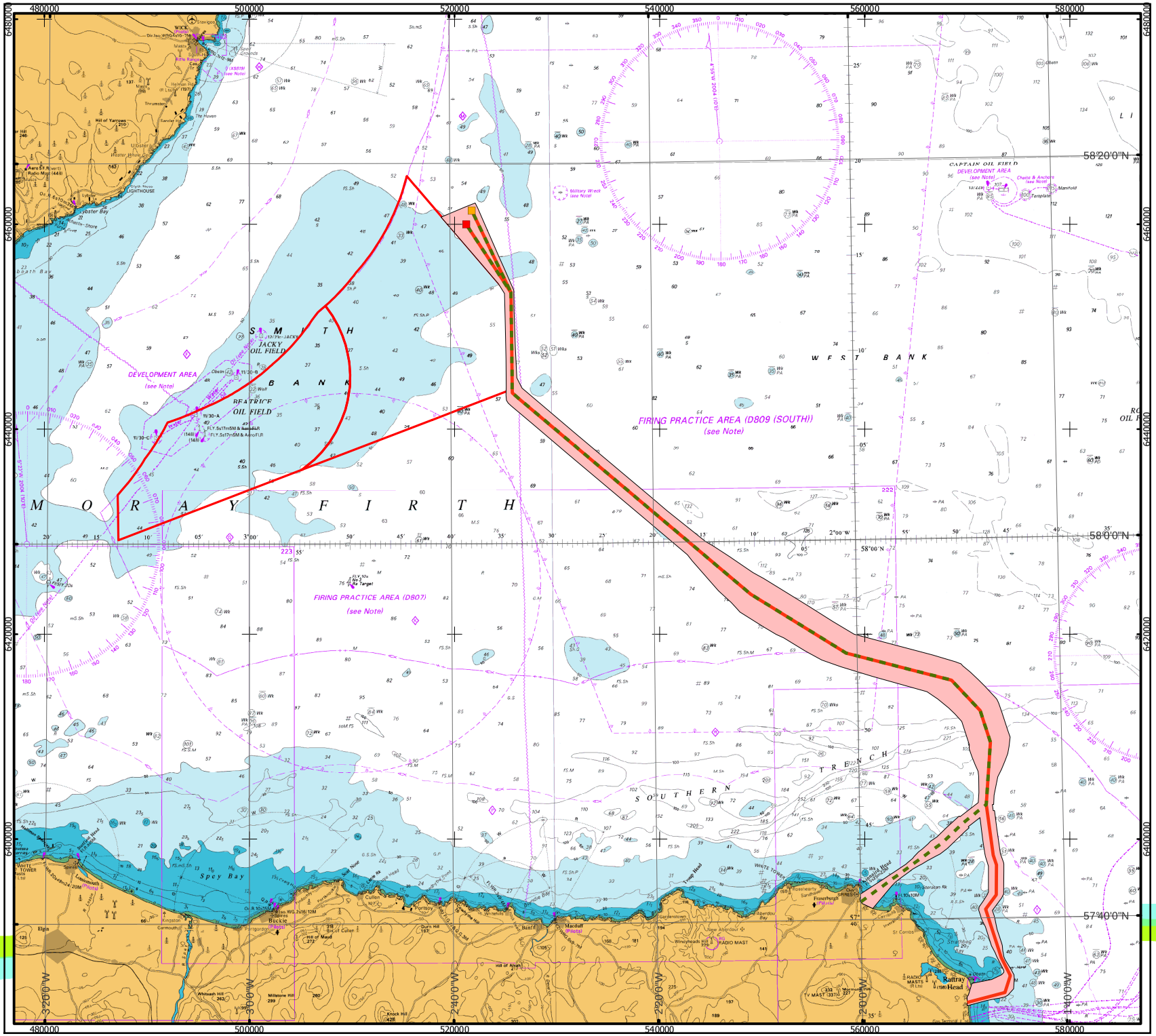
CURRENTLY SELECTED EXPORT CABLE ROUTES AND ONSHORE SUBSTATION LOCATION

As described above, two main routes are still being considered (onshore and offshore) based on two preferred landfall points (Figure 2-5). It is MORL's intention to define the exact route and location of the onshore substation following completion of the geophysical and shallow geotechnical surveys, environmental survey results and landowner negotiations and prior to submission of the planning application.

2.3 THE PROPOSED SCHEME

2.3.1 TIMELINE

An indicative timeline for development of the OFTO infrastructure works is provided in Figure 2-6. The proposed programme is to undertake up to a year of studies to support the EIA and consent applications. MORL intends to submit the required consent applications for the OFTO assets at the same time as the Eastern Development Area wind farm applications. There will be different organisations responsible for issuing the consents (see Section 1.3 Regulatory and Policy Background for detailed consenting information), however for the purposes of this document it is assumed that there will be similar consenting timescales. It is currently understood that the Scottish Government Energy and Consents Unit and Marine Scotland aim to determine consent non-contentious applications within a 9 month period. Therefore, the award of consents would be anticipated for early-mid 2013. Pre-front end engineering design (FEED) and FEED studies will be undertaken between 2010-2013. The installation process of OFTO assets will begin in 2014 and the construction is anticipated for completion in 2019 (assuming a phased installation process along with the construction of the wind farms).



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- Moray Offshore Wind Farm Boundary
- Hub-1 (Preferred)
- Hub-2 (Backup)
- Fraserburgh (Hub) - Preliminary
- Rattray (Hub) - Preliminary
- OFTO Offshore Study Area

Horizontal Scale: 1:500.000

A4 Chart

0 5.000 10.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

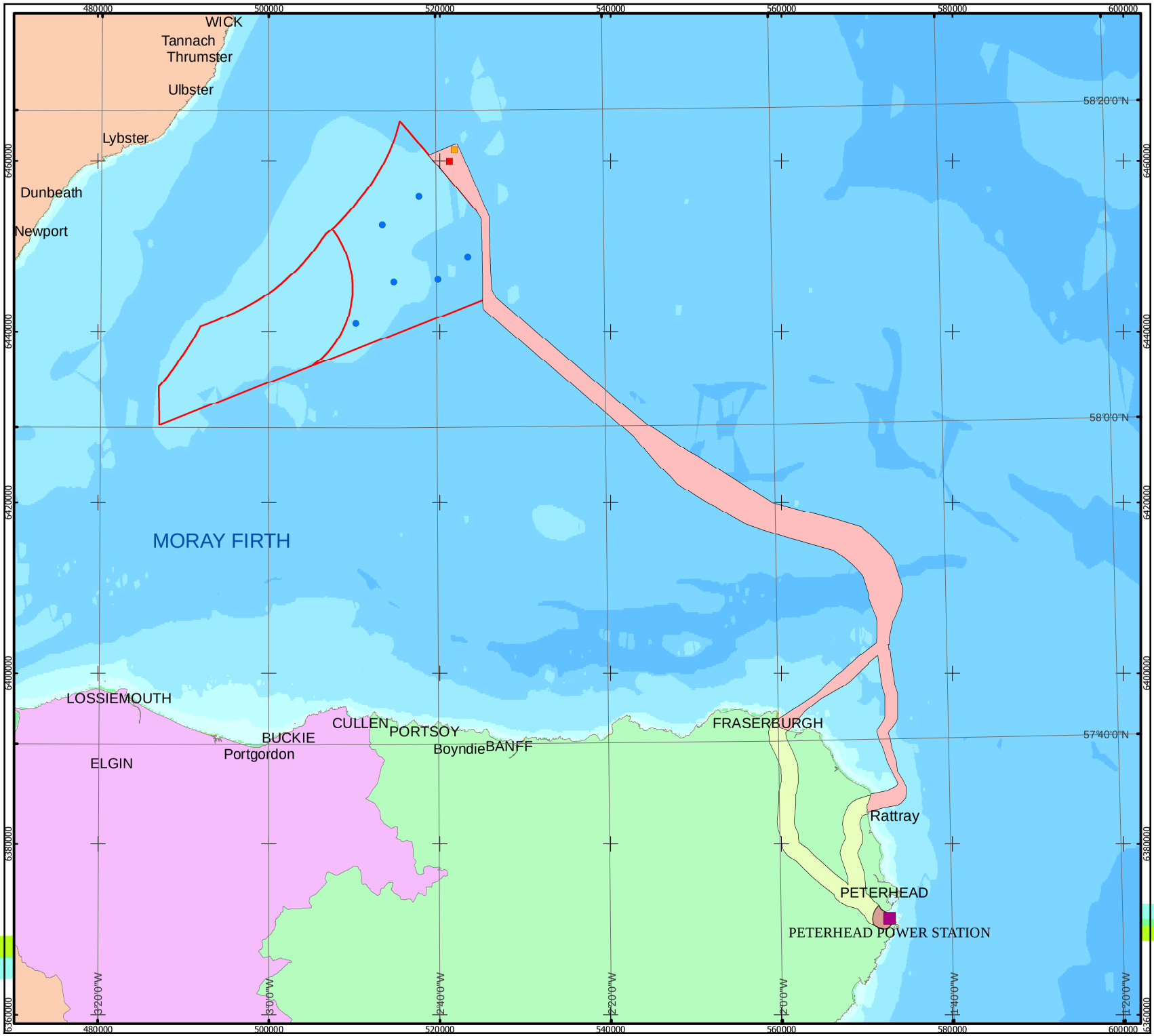
Produced: RH
Reviewed: CR
Approved: CR

Date: 14/07/11 | Revision: B

REF: 8460001-PSO0010-MOR-MAP-006

Fig:2-4 Final Offshore Cable Route

Moray Offshore Renewables Ltd



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- Hub-1 (Preferred)
- Hub-2 (Backup)
- Estimated Substation Locations (Representative Only)
- OFTO Offshore Study Area
- OFTO Onshore Study Area
- Onshore Substation Study Area

Horizontal Scale: 1:600.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-009

Fig:2-5 Cable Route Study Corridors & Substation Areas

Moray Offshore Renewables Ltd

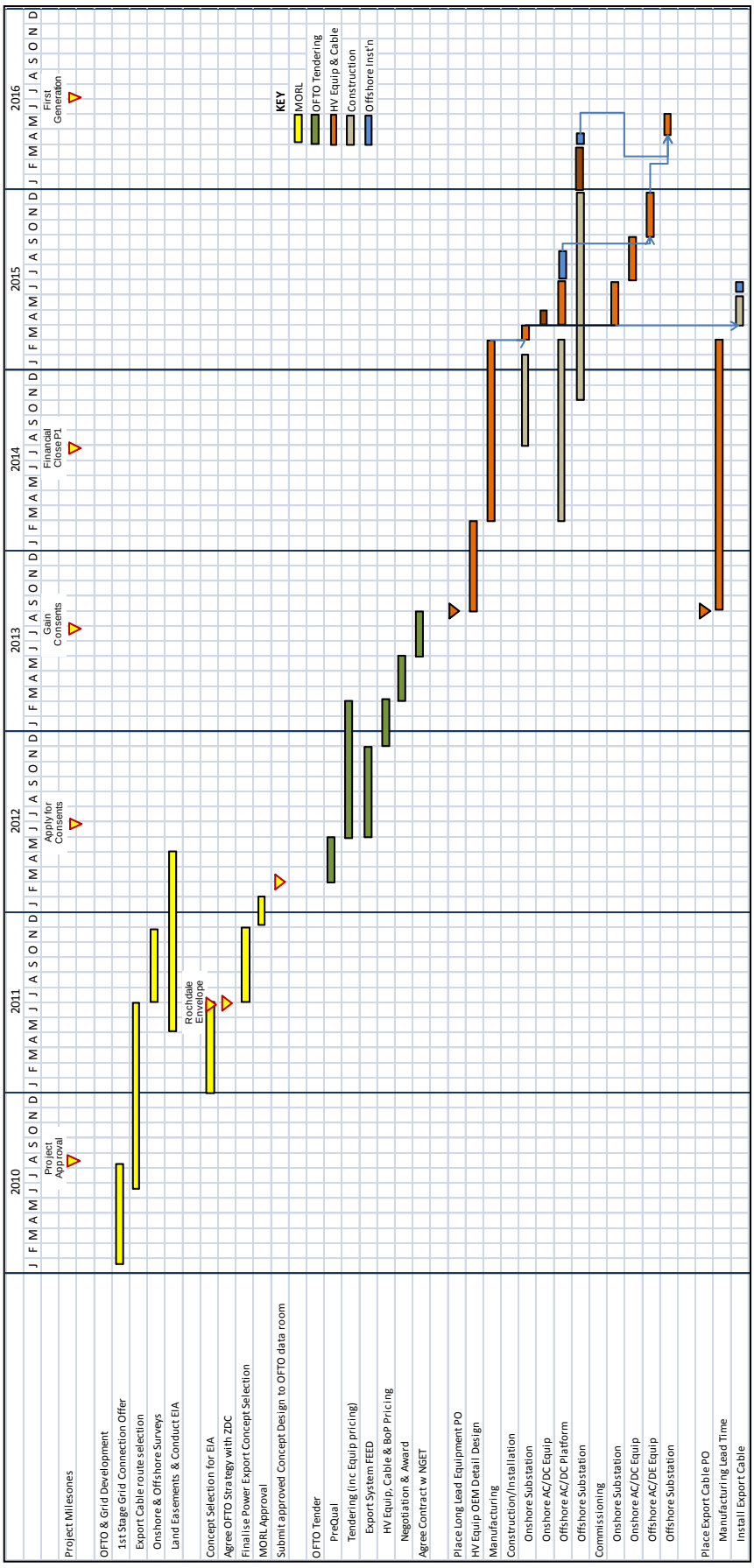


Figure 2-6: Ilustrative Timescale for the Development.

2.3.2 OFTO Offshore Platform Infrastructure

OFTO Offshore Electrical Infrastructure

The OFTO offshore electrical infrastructure will comprise a number of offshore substation platforms:

- Three to six HVAC platforms located within the MORL zone. These will house substations which will form the interface between the inter-turbine cables and the offshore transmission system.
- An additional two HVDC Platforms may potentially be located externally to the development zone somewhere along the cable route to shore.

Each offshore substation platform will contain as a minimum:

- Transformers;
- Switchgear;
- Reactive compensation equipment;
- Convertor technology (where applicable);
- Auxiliary supplies equipment; and
- Control and instrumentation necessary for the control and operation of the platforms.

The installation activities associated with the offshore substation platforms are discussed in section2.4.2 Construction.

Foundation & Support Structures for Offshore Substation Platforms

This section includes foundations and support structures for the offshore substation platforms.

The overriding factors influencing the choice of foundation and support structure for a specific project are the dimensions and weights of the electrical infrastructure to be used, nature of ground conditions in the area and water depth.

The design of the foundations and support structures for the offshore substation platforms is at an early stage. In order to provide the required level of detail on the project that will be required for the EIA, options are currently being considered by MORL for all of the key components detailed above, such that once the type number and location of offshore substation platforms is known it will then be possible to select the optimal foundation and support structure type.

Taking into account the number of foundation and support structure types currently under consideration, from a foundation and substructure point of view, they can be divided in two groups:

- Foundations and Substructures for Smaller (Lighter) Electrical Infrastructure (HVAC Systems); and
- Foundations and Substructures for Larger (Heavier) Electrical Infrastructure (HVDC Systems).

For the smaller platforms, MORL is studying the possibility of using the same foundation and substructure type as used elsewhere in the project for the wind turbines.

Based on the known physical properties within the zone and the inherent uncertainty with the location of the platforms (seabed properties and water depths), one of the most versatile and robust foundation and substructure concept is a lightweight jacket structure. The generic description of 'lightweight jacket structures' covers a number of different concepts including:

- Braced monopods;
- Tripod structures; and
- Three and four legged lattice structure (jacket structures).

Another foundation and substructure concept, already installed in several offshore wind farms and under consideration as part of MORL's development, is the gravity based structure (GBS). There are many variations on this concept, the most common one being a concrete cone shaped structure placed on a gravel bed. These structures are supported by gravity alone, and after being placed in their determined location they are filled with ballast.

These concepts can be tailored to suit the variable water depths and seabed gradients.

For the larger platforms, the same foundation and substructure concepts (and the assessment of their suitability) as discussed above still apply. However, given the increased load bearing capacity required, such foundations and substructures will require to be of a specific design, eliminating the potential for commonality in design with the wind turbine foundation and substructure designs.

In order to achieve possible standardisation of design across multiple wind farms, some floating solutions are being proposed. Designs would be developed for a limited range of capacities, to develop a standard range of solutions. Such floating solutions include:

- Moored System - The electrical infrastructure would sit atop a hull(s), providing buoyancy. The hull(s) would be permanently on location via a mooring system (typically either a tension leg system or catenary mooring system).
- Self Installing System - The electrical infrastructure would sit atop a hull(s), providing buoyancy and would comprise a number of extendable legs. The complete structure would be towed to the installation location where the legs would be jacked down to the seabed, raising the hull(s) and electrical infrastructure clear of the sea.

Such floating solutions are applicable to both the smaller and larger offshore substation platform requirements.

The Jacket, GBS, Moored and Self Installing foundation and substructure designs all borrow from the expertise built up from oil and gas development experience in the North Sea.

The installation activities associated with the offshore substation platforms are discussed in section 2.4.2 Construction.

This summary represents preliminary findings, to be reviewed when site specific survey data are available. MORL is not formally ruling any particular foundation type out at this stage due to changing economic and technological circumstances that may prove one or another technology more appropriate nearer the time of construction.

All of these offshore substation platforms will include access facilities and appropriate lighting and marking for surface navigation. Options for the configuration of the foundations and substructures, and details of their potential environmental impacts, will be included in the Environmental Statement.

SCOUR AND IMPACT PROTECTION

The substructure and foundation concept as well as the current regime approaching seabed level defines the type and extent of scour protection required, and typically a 'scour allowance' is specified in the design of jackets. However, as foundation size increases the potential scour depth around the structure also increases and hence there is a greater the need to protect the foundation, i.e. it becomes more efficient to protect the foundation rather than utilise a design scour allowance.

North Sea GBS have to date typically used rock in a relatively complex scour protection blanket, involving the placing of carefully specified and graded rock to satisfy both stability criteria of the surface armour layer, but also the performance of a filter layer to prevent finer material being drawn through the armour layer.

The suitability of installing rock or concrete mattresses for cable protection, especially around the structure bases, will be assessed based on the seabed current data across the proposed development area and the assessed risk of impact damage.

2.3.3 OFTO CABLE INFRASTRUCTURE

The OFTO cable infrastructure will consist of both onshore and offshore cable systems. The constituent parts of this overall system can be summarised as follows:

- Offshore Transmission System: a number of submarine export cables between the offshore platforms and the shore, which are used to transmit the energy generated by the WTGs to the shore. The OFTO cables will consist of a series of HVAC cables and potentially some HVDC cables. The cables will include embedded fibre optic data and communication cable cores.
- Subsea cabling specification (AC or DC, voltage levels i.e. 150kV/ 220kV / 320kV).
- Cable Landfall: The point at which the submarine cables are physically brought ashore.
- Onshore Transition Jointing Pit: the interface between the offshore and onshore cables systems.
- Onshore Transmission System: a number of underground circuits which transmit the energy generated by the wind turbines from the landfall to the connection point.
- Onshore cabling specification (AC or DC, voltage levels i.e. 150kV/ 220kV / 320kV).

It should be noted that all data and communications equipment installed will be provided solely for the purposes of operating the wind farm and associated OFTO assets. These facilities are not intended to facilitate operation of a commercial telecommunications service.

2.3.4 OFTO ONSHORE INFRASTRUCTURE

The design of the OFTO onshore electrical infrastructure is at an early stage. In order to provide the required level of detail on the project that will be required for the EIA, options are currently being considered by MORL for all of the key components require to facilitate the final connection to the NETS in addition to the cable infrastructure described in the previous section.

The key components for the onshore infrastructure may consist of but not be necessarily limited to:

- Grid transformers;
- HVAC switchgear;
- Reactive compensation;
- Auxiliary transformers;
- HVDC switchgear and converter apparatus where applicable;
- Control and instrumentation equipment;
- Telecoms equipment;
- Control building;
- Fenced compound;
- Associated civil ground works; and
- Access road.

2.4 OFTO CONSTRUCTION

2.4.1 ENVIRONMENTAL MANAGEMENT

Prior to construction a comprehensive Environmental Management Plan (EMP) will be implemented in consultation with statutory consultees, with a suite of complementary management plans corresponding to different aspects of the construction activity. The EMP will form a component part of the construction contract for the development. The documents, which will be tailored specifically to ensure compliance with the consent conditions for the project and current environmental best practice, will include the following:

- Monitoring Protocol (as per statutory consents);
- Incident Reporting and Non Conformance Procedure;
- Emergency Response Plan;
- Collision Risk Management Plan;
- Marine Pollution Contingency Plan;
- Flood and Water Pollution Prevention Plan (onshore);
- Dropped Objects and Materials Recovery Plan;
- Archaeological Plan;
- Noise, Dust and Vibration Management Plan; and
- Waste Management Plan.

2.4.2 CONSTRUCTION

Construction for the offshore transmission infrastructure is currently anticipated to occur over a period of two years. Only limited information is available at present on the nature of the construction process, since the major parameters of the proposed development have not yet been defined in detail. Key aspects in defining the construction methodologies (and therefore the likely construction activities) will be choices on the following:

- Port(s) used as a base for the construction phase; and
- Vessels to be used for the offshore construction works.

Decisions on these will also be influenced by the nature of the substructure and foundation concept to be used, which will be addressed during the EIA phase. More detail on the options for ports and vessels will be provided in the ES. However, for the purpose of this document, it can be assumed that the principal stages of manufacturing and transporting the various OFTO components to sites within the zone are likely to be as follows:

- Manufacture of components (including; substructures and foundations, piles (if applicable), offshore substation electrical infrastructure, HVAC subsea cables, HVDC subsea cables as well as electrical components and major balance of plant items);
- Transport of components to the area;
- Storage of components as required at the port location(s) chosen as the construction base;
- Marine transportation of components to site of installation; and
- Moving construction vessels to the installation site.

It can be assumed that the key stages associated with the installation of the OFTO infrastructure are likely to be as follows:

- Pre-construction site investigation (i.e. cone penetration testing, CPT / boreholes);
- Substructure and foundation installation and associated site preparation;
- Disposal, if necessary, of any spoil excavated during installation;
- Installation of offshore substation platforms;
- Installation of HVAC OFTO cable between offshore substation platforms;
- Installation of HVAC or HVDC cables between offshore platforms and the shore landing area;
- Installation of transition jointing pit at shore landing;
- Installation of HVAC or HVDC cables between onshore landing area and the onshore substation; and
- Construction of onshore substation to facilitate connection to the NETS.

It should be noted that construction compounds, storage facilities, laydown areas and access / haulage tracks will be required for the onshore cable installation work construction of the onshore electrical infrastructure.

The installation of all OFTO offshore cables to the shore from the offshore substation platforms will be performed from a cable laying vessel(s). The applicability / suitability of burying the cables will be assessed using a detailed trenching review and burial protection index study.

2.5 OFTO OPERATION

2.5.1 ACCESS TO SITES

Operation of all OFTO assets will continue 24 hours per day; 365 days per year, and therefore the final site(s) identified within the proposed development area will require to be accessible at any time. Operational activities will be predominantly onshore activities with automated systems utilised to the fullest extent to ensure minimal operational activities offshore.

Scheduled maintenance activities will be confined to planned interventions for limited periods on an annual basis.

2.5.2 LIGHTING AND MARKING

The lighting and marking of the offshore OFTO substation platforms will be agreed in consultation with the Northern Lighthouse Board, the General Lighthouse Authority (GLA) for Scotland and the Isle of Man, the Maritime and Coastguard Agency (MCA), the Civil Aviation Authority (CAA) and the Ministry of Defence (MOD).

The positions of the offshore OFTO substation platforms, subsea cables and ancillary structures will be conveyed to the UK Hydrographic Office (UKHO) so that they can be incorporated into Admiralty Charts and the Notice to Mariners procedures.

2.5.3 OFTO CONTROL AND SUPERVISION

Once commissioned, the OFTO assets will operate automatically. The operation and control of the OFTO assets will be assessed by a Supervisory Control and Data Acquisition (SCADA) system, installed at each offshore platform, and at the onshore control base. The SCADA system will enable where practicable the remote control of all OFTO assets, as well as information transfer, storage and the shutdown of any individual asset in emergency circumstances.

2.5.4 OFTO INSPECTION AND MAINTENANCE

The OFTO assets will be serviced and maintained throughout their life which shall be as a minimum equal to the design lifetime of the wind farm (wind farm lifetime is circa 50 years with repowering). Maintenance of the assets is normally separated in to three categories:

- Periodic overhauls;
- Scheduled maintenance; and
- Unscheduled maintenance.

PERIODIC OVERHAULS

These will be carried out in accordance with the Original Equipment Manufacturers (OEMs) warranty. They are planned for execution in periods of the year with the best conditions, preferably in the summer, they will be scheduled to coincide with planned maintenance outages.

They are carried out according to the supplier's specifications and typically include function and safety tests, visual inspections, analysis of oil samples etc.

SCHEDULED MAINTENANCE

This applies primarily to inspections and testing of safety equipment, auxiliary power supplies, major balance of plant equipment and protection systems. A scheduled inspection of offshore and onshore substation is likely to occur every 12 months though specific activities may occur less frequently. Additional tasks will typically include inspection on faults and minor fault rectification.

UNSCHEDULED MAINTENANCE

This applies to any sudden defects. The scope of such maintenance would range from small defects to complete failure or breakdown of main components. Such maintenance would require the intervention of construction vessels similar to those involved with the construction of the OFTO infrastructure.

Inspections of substructures, foundations, support structures and subsea cables will be performed on a risk based assessment basis. As such, an initial base line inspection survey will be performed, thereafter the scope and period of inspections will be determined based on the findings of each previous inspection.

2.6 OFTO DECOMMISSIONING

The lease term will be agreed with The Crown Estate and will be in line with the life of the wind farm assets. Repowering will be considered at the end of the design life of the wind farm and OFTO infrastructure. Decommissioning will be a key requirement by the Crown Estate lease agreement and Energy Act 2004 and will influence all stages of design of the OFTO infrastructure. This will be addressed in the Environmental Statement.

The OFTO infrastructure, cables and support structures will be decommissioned following the end of their operational life. The extent of decommissioning is dependent on the type of support structure adopted, and options will be assessed in conjunction with the design of the development in the Environmental Statement.

2.7 PORTS & HARBOURS

Ports and or harbours will be required during the construction and operation and maintenance phases of the OFTO infrastructure. During the construction phase, deepwater ports with facilities for pre-assembly (e.g. site office, laydown areas, warehouses etc) will be required. The ports or harbours used during the operation and maintenance phase are likely to be smaller than that used during construction. MORL is in the process of identifying and agreeing which ports and harbours will be used during the lifetime of the project.

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3 Cumulative and In-combination Impacts

Cumulative impacts are the effects of one type of development with other types of the same development (i.e. wind farms and other wind farms, or cables with other cables). In-combination effects are the effects of the above in combination with other, different projects and activities (e.g. wind farms in combination with dredging or wind farms in combination with shipping).

Not all existing or planned infrastructure/operations will be used in each individual impact assessment. However, the following provides a list of those infrastructure/operations which may be used within the EIA. A section on cumulative assessment will be provided within the ES which will detail cumulative impacts relating to each receptor and considering MORL's proposed wind farm development and offshore transmission infrastructure. Developments that will be included within the cumulative impact assessment for MORL's offshore transmission infrastructure include:

- Existing cable and pipelines within the Moray Firth;
- Beatrice Offshore Wind Farm transmission infrastructure;
- Proposed SHETL cable;
- Proposed HVDC Hub;
- SHETL's proposed substation at Peterhead (extension of existing substation); and
- Similar developments within the vicinity of the onshore OFTO assets.

Developments/activities that will be included within the in-combination impact assessment for the offshore transmission infrastructure include:

- Moray Firth Round 3 zone eastern development area;
- Moray Firth Round 3 zone western development area;
- Beatrice Offshore Wind Farm;
- Beatrice demonstrator offshore wind turbines;
- Existing oil infrastructure;
- Proposed oil infrastructure developments or activities (e.g. Polly well and/or seismic activity);
- Existing commercial fisheries in proximity to the proposed development area;
- Ministry of Defence operations (where known);
- Moray Firth marina development; and
- SHETL's carbon capture and storage facility at Peterhead.

In light of the potential for cumulative and in-combination impacts, MORL and Beatrice Offshore Wind Limited (BOWL) have formed the Moray Firth Offshore Wind Developers Group (MFOWDG), in association with the Crown Estate. The purpose of MFOWDG is to allow for collaboration to identify potential cumulative effects and ensure a standardised approach to their future assessment as part of individual project EIAs. A report has been prepared on behalf of MORL and BOWL detailing cumulative assessment methodologies for the offshore wind farm developments (ERM, 2011a). This report will also support the cumulative impact assessment for MORL's and BOWL's offshore transmission infrastructure development as appropriate.

MORL also intends to have discussions with other Moray Firth stakeholders to determine the potential for in-combination impacts with other potential developments (onshore and offshore) in the area.

4 Consultation

4.1 RELATIONSHIPS AND STAKEHOLDER ENGAGEMENT

As described in the scoping document for the offshore generating station (MORL, 2010), MORL recognises that the proposed project will be of interest to a wide range of organisations, individuals and communities, especially in north-east Scotland and a stakeholder engagement strategy has been produced to encourage and enable them to be part of its development.

MORL remains committed to engaging with the communities in which they operate, to address any concerns they may have in advance of the project application submission. This will be achieved through the various processes detailed in our strategy, including letters, meetings, events and exhibitions, newsletters and websites.

As part of the EIA, a full public consultation will be undertaken for the onshore works. This will involve the mapping of stakeholders and representative organisations and individuals who have a geographic or topical interest in the onshore works and their impact, in order that a communications strategy can be deployed to seek views and comment on the proposals.

The consultation will initially focus around the publication of a scoping report for the EIA (current document); a non-technical summary will be provided, and distributed to identified stakeholders, and their opinion sought within a defined consultation period.

Communications will be tailored to suit the geography of the chosen route, and activities during this period will include meetings with relevant stakeholder groups, local public exhibitions, and use of the local authority and community council frameworks to disseminate appropriately targeted literature to stakeholders, and to gather opinion on those proposals.

Communications with these stakeholder groups will be co-ordinated by MORL Stakeholder Manager, Craig Milroy.

5 Preliminary Environmental Considerations

This section is divided into three areas and includes the potential for impacts of the proposed development on the physical, biological and human environment. A holistic approach to the EIA process will be taken, which will identify the potential inter-linking of the environmental features and the potential for "knock-on" impacts.

Existing baseline information, scoping of potential impacts, guidance documents and EIA methodologies are presented if the information has been available at the time of writing.

As the final export cable route (onshore and offshore) and the location of substations (onshore and offshore) has not been decided, the potential impacts discussed below are for the two currently preferred routes and potential substation locations (see Section 2 for project description).

5.1 PHYSICAL ENVIRONMENT

Key aspects of the physical environment that are relevant to understanding the potential environmental impacts of construction and operation of the offshore transmission infrastructure are categorised as follows:

OFFSHORE
- Geology
- Bathymetry
- Hydrodynamics (wave climate and tidal regime)
- Sedimentary and Coastal Processes
- Underwater Noise

ONSHORE
- Superficial and Solid Geology
- Water Environment
- Contaminated Land
- Airborne Noise and Vibration

5.1.1 DATA SOURCES

The following previously collected or developed data sources provide information on the present natural physical environment:

General:
- UK Offshore Energy Strategic Environmental Assessment, DECC
- SEA 5: Strategic Environmental Assessment of parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland, DTI

Additional sources for:

OFFSHORE
Geology, bathymetry and Sedimentary and Coastal Processes -
- UK Hydrographic Office Admiralty Charts
- British Geological Society
- Satellite geodesy and ship soundings by Smith & Sandwell
- SEA 5: Seabed and Superficial Geology and Processes (Holmes *et al*., 2004)
- Remote sensing and aerial photography (Google Earth)

Wind -
- UK Meteorological Office
- Beatrice demonstrator project

Hydrodynamics (waves and tides) -
- UK Hydrographic Office
- UK Meteorological Office wave model data
- Wavenet directional wave buoy data
- British Oceanographic Data Centre
- National Tide and Sea Level Facility
- Scottish Environmental Protection Agency
- Atlas of Renewable Energy Resources (BERR, 2008)

ONSHORE
Superficial and solid geology, water environment and contaminated land:
- Scottish Environmental Protection Agency (SEPA)
- British Geological Survey (BGS)
- Scottish Natural Heritage (SNH)
- Registers of Scotland (ROS)

5.1.2 PHYSICAL ENVIRONMENT (OFFSHORE)

The baseline environmental description is provided in the context of the southern and central Moray Firth.

5.1.2.1 BATHYMETRY AND GEOLOGY

The following overview of the geological environment of the Moray Firth provides a context for both the metocean and sedimentary environments. Descriptions of the deeper geological units are of relevance when considering the likely nature of any potential drill arisings, if required for the offshore substation platforms.

A review of the existing bathymetry and geology for the proposed development area was undertaken by Senergy (2009), Metoc-Hyder (2010) and as part of national strategic studies by Holmes *et al*. (2004). The findings relevant to this study are summarised below.

The geomorphology (which includes the bathymetry) of the outer Moray Firth is characterised by a number of banks and deep water channels; the largest bank feature being the Smith Bank. Within the zone, where offshore substations will be located, water depths range from approximately 35 m LAT to 60 m LAT. Along the export cable route, water depths are typically 60-80 m in the central part of the Moray Firth, increasing for a short distance to approximately 150 m to transit the eastern end of the Southern Trench, shoaling then relatively gradually from 60m depth to the landfall positions. The proposed cable route avoids the deeper parts of the Southern Trench, which has steep slopes and maximum water depths of up to 220m (Figure 5-1; Admiralty Chart 115; Smith & Sandwell, 1997).

The bathymetric datasets (Admiralty Chart 115; Smith & Sandwell, 1997) and assessment of a selective coverage of high resolution bathymetry data by Holmes *et al*. (2004) suggest that the seabed undulates gently across the proposed development area, gradually building up towards land, with no indications of extreme or rugged topography. It should be noted that the charted data sets do not provide the level of detail needed to define local topographic irregularities and the high-resolution data was only of limited spatial coverage.

The following summarises the geomorphology of the region as described by Holmes *et* al. (2004) Across much of the Firth, bedrock is overlain by relatively erosion resistant gravelly moraine deposits; the majority of the volume of the Smith Bank is reported to comprise such bedrock and moraine units (stabilising the long term position of the Bank). These sedimentary units are widely overlain by relatively thin layers (1-2 m thick) of Holocene sediments, mainly comprising sands and gravels but also biogenic carbonate (shell) material, in varying proportions across the Firth. Some deposition of fine (muddy) sediments has been observed in deeper channels, such as the Southern Trench and Smilers Hole along the southern margins of the Firth. In the nearshore approaches along the east Aberdeenshire coast, Admiralty Charts also indicate a rocky environment with frequent sandy embayments or rocky inlets. A map of the geology within the wider Moray Firth is shown in Figure 5-2 (Source: BGS, British Geological Society).

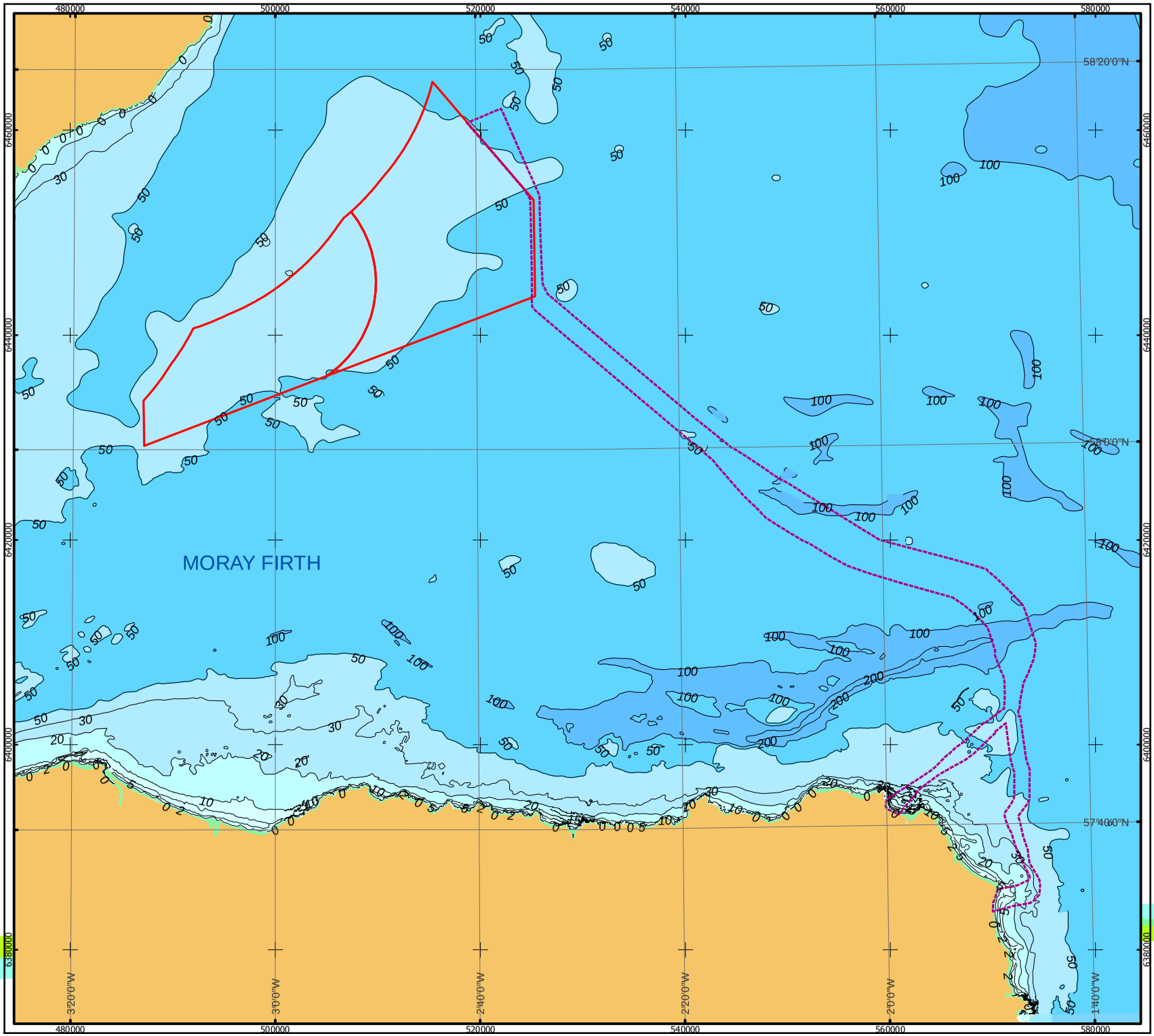
Faulting has been detected in the Lower Cretaceous sediments up to the base of the Quaternary soils (Holmes *et al*., 2004).

There is no evidence at this stage to suggest that shallow gas is present across the development area (Holmes *et al*., 2004).

There is no evidence of chalk or peat deposits in the underlying geology that might be resuspended as a result of drilling activities.

The UK and the Moray Firth in particular are areas of low seismicity and the risk to offshore structures is considered to be correspondingly low (Health & Safety Executive, 2002; Holmes *et al*., 2004).

It is also noted that there is the possibility for the occurrence of potentially hazardous unexploded ordnance (UXO) which may occur as a result of military practice within the area and historic practices of inaccurate ammunition dumping (Senergy, 2009). This “man-made” occurrence would potentially pose a hazard to construction. Other human environment seabed obstructions are discussed in section 5.3.6 and section 5.3.9.



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REPSOL

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KEY

- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- Bathymetry Contours

Bathymetry (m)

- Drying
- <=10m
- <=20m
- <=50m
- <=100m
- <=500m
- <=1000m
- <=5000m
- <=10000m
- >10000m

Horizontal Scale: 1:500.000 A4 Chart

0 5.000 10.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 21/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-015

Fig:5-1 Bathymetry of the Proposed Development Area

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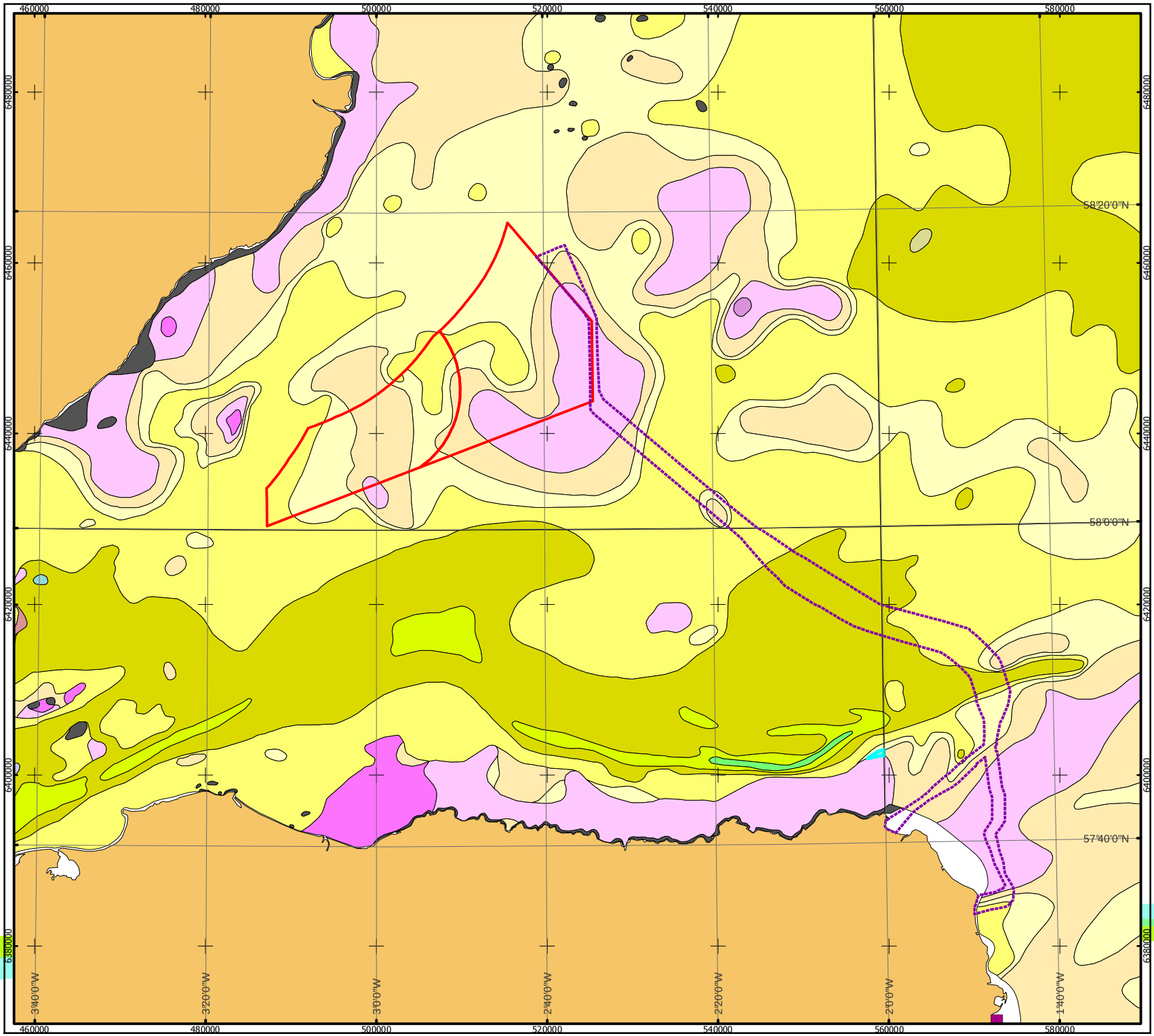

edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- GRAVEL, MARINE
- GRAVEL, MARINE, MUDDY
- GRAVEL , MARINE, MUDDY, SANDY
- GRAVEL, SANDY, MARINE
- MUD
- MUD, MARINE, GRAVELLY
- MUD, MARINE, SANDY
- SAND, GRAVELLY, MUDDY
- SAND, MARINE, GRAVELLY
- SAND, MARINE, MUDDY
- SAND, MARINE, GRAVELLY, MUDDY
- SAND, MARINE, GRAVELLY
- SAND, MARINE
- ROCK (UNDIFFERENTIATED)

Horizontal Scale: 1:600.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: DL
Approved: CR

Date: 16/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-021

Fig:5-2 Geology - Proposed Offshore Development Area

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5.1.2.2 METOCEAN ENVIRONMENT

The following overview of the metocean climate provides an indication of the magnitude and variability of the driving forces to the sedimentary environment. Of particular relevance is the wind and wave climate, which is shown in the following section to largely control sediment transport and natural turbidity in the central parts of the Firth. Tidal processes, playing a secondary but not insignificant role in guiding the direction of sediment transport, are shown to be largely benign in most parts of the route, but increasing in magnitude near to the landfall positions.

WIND CLIMATE

The following summary of wind climate in the Moray Firth is important to the study in so far as it controls the wave climate. Wave climate will be shown in the next section to be the dominant control on sediment transport processes in the outer Moray Firth and within the proposed development.

Wind data most closely representative of the Moray Firth and the length of the cable route are currently available from two sources. The primary source for in-situ measured wind data in the outer Moray Firth is a LiDAR installation on the Beatrice Alpha platform, which was installed in 2006 to support the Beatrice Demonstrator project. In addition, hindcast data are available from a UK Met Office meteorological model which has two data cells located at the eastern and the western ends of the Zone. The data were for an effective height of 19 m above sea surface and were obtained in the form of annual and monthly frequency statistics based on approximately 9 years of hindcast data.

The annual average statistics are summarised in Figure 5-3 in the form of wind roses for the full data set (annual average) and for representative summer (June) and winter (December) periods. The data show winds most commonly originate from south-westerly or south-easterly directions with wind speeds up to 12m/s. During summer months, wind speeds do not typically exceed 12m/s, but are more likely to come from a wider range of wind directions. Stronger winds (from 12 to 25m/s) tend to occur only in winter months and dominantly come from south-westerly through to northerly directions. The frequency of relatively calm conditions (<3m/s wind speed) is also seasonal (i.e. more frequent in summer months); calm conditions occur approximately 9-10% of the year on average.

TIDAL REGIME

The Moray Firth is characterised by a progressive, open coastal tidal regime. The tidal wave initially approaches from the north, from the northern North Sea, becoming aligned to the axis of the Firth in central parts. At the start of the export cable route, the maximum astronomical tidal range (at the northern coast of the outer Moray Firth) is 3.9 m, i.e. a meso-tidal environment. At Aberdeen, to the south of the Firth and closer to the end of the export cable route(s), the maximum tidal range is also slightly larger (4.9 m). Along the route, the tidal range is relatively small in comparison to the typical total water depths (60 to 150 m).

Tidal currents along most of the cable route are notably weak, with peak near surface mean spring current speeds of less than 0.3-0.4kts (0.15-0.21m/s); tidal current speeds are typically less near to the bed and for a significant proportion of the time during times of non-peak flow, slack water and also generally during neap tidal conditions. Peak tidal current speeds are however higher (up to approximately 2kts or 1m/s) in the vicinity of the cable landfall points around Rattray Head. Tidal current streams are typically aligned to the adjacent coastline over much of the region but tend to rotate in central parts to describe a smooth sweep of the tide into, across and out of the Firth.

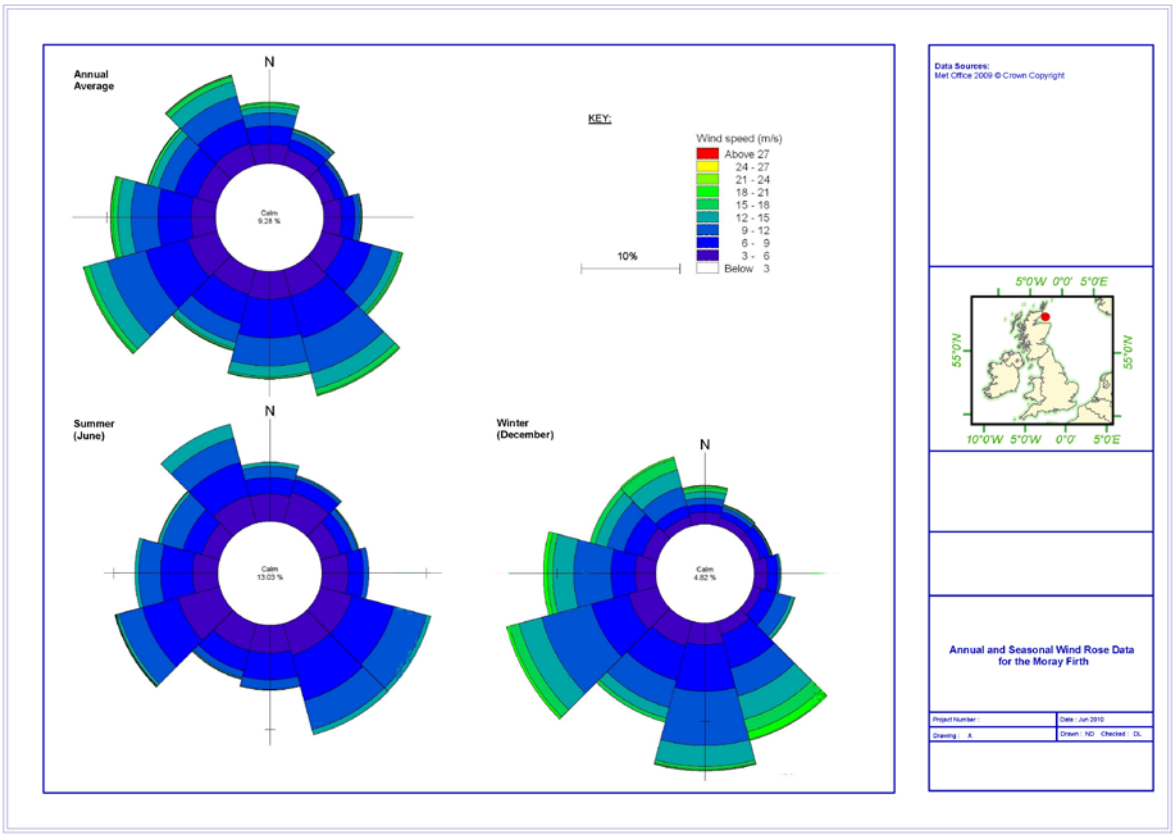


Figure 5-3: Annual and Seasonal Wind Rose Data for the Moray Firth.

Both tidal range and therefore tidal current speed predictably vary on a variety of timescales from hours (tidal cycle) to weeks (spring-neap) to months (solstice-equinox) to years (the 18.6 year nodal cycle). Mean water levels may also vary over the lifetime of the development as a result of a combination of climate change affecting mean sea level globally and regional post-glacial rebound of the underlying geology.

Significant storm surges are generally reported to be of relatively small amplitude in the Moray Firth, in comparison to the larger values observed elsewhere in the North Sea (2 to 3m). This is attributed to the protection afforded by the position, shape and relative orientation of the Firth in the North Sea. The modelled extreme, depth averaged, surge currents over 50 years in the Moray Firth are about 0.60 to 0.80m/s (Flather, 1987). It should be noted that, depending on their timing, storm surge effects can either be relatively accentuated or negated by normal tidal processes.

WAVE CLIMATE

The outer Moray Firth is exposed to large storm driven waves with long wave fetches from offshore directions. The largest fetch for wave development is from the north through to north-east, however, depending on the actual direction of approach, the position of the offshore substation platform infrastructure within the zone behind the Wick peninsula may offer variable degrees of protection, potentially leading to variation in wave exposure over the site.

The height of short to intermediate fetch length wind waves generated within the Firth will depend upon the wind direction as well as the speed, which controls the wave fetch length. The previously described wind climate suggests that wave climate and storm intensity will be seasonal in nature and will include a wide range of approach directions.

The offshore wave climate may be variably modified at the coastline where waves experience shoaling and refraction as they move into shallower water. These processes are not generally important to the cable route, except closer to the point of landfall.

CLIMATE CHANGE

Climate change is an important and contemporary issue which may potentially affect the normal baseline environmental conditions at the proposed sites over the lifetime of the proposed development; the predicted effects of climate change are irrespective of the development's presence or chosen design. Of most relevance to an offshore wind development including OFTO infrastructure, climate change is predicted to cause a rise in mean sea level and an increase in average storm intensity with time. The exact magnitude and rate of these changes are not widely agreed at present due to the uncertainty involved in predicting climate change. However, the UK government does issue guidelines for appropriate consideration of these factors.

The effects of climate change are likely to be most evident along the shorelines where much of the wave energy is ultimately dissipated, potentially leading to modified rates of littoral sediment transport. The advancing position of mean high water on beaches may also lead to wave energy dissipation higher up on the foreshore with anticipated beach loss and scour in front of sea walls. In offshore areas, the relative water depth over sandbanks may increase, leading to greater exposure of the coast to the larger waves from offshore directions. Any potential effect of the proposed wind farm development will also need to be considered within the context of these natural changes.

Increased wave energy offshore may have consequences for the frequency and magnitude of sediment transport events resulting in elevated levels of suspended sediment concentrations (SSC) within the area, despite any influences brought about by the proposed development.

5.1.2.3 SEDIMENTARY ENVIRONMENT

REGIONAL SEDIMENTARY PROCESSES

The following overview of regional sedimentary processes demonstrates the stable nature of the regional geology of the Moray Firth where sedimentary bodies largely comprise relic (erosion resistant and stable) features. Also, that sedimentary processes are typically low-energy and dominantly episodically wave driven. A further consideration of naturally occurring sediment resuspension reaffirms the importance of storm waves in driving such processes.

On the basis of the observed bed features and the sediment types (see section 5.1.2.1) present in comparison to the typical wave climate and tidal regime, sediment transport processes in the outer Moray Firth are considered unlikely to be driven by the normal tidal currents alone. Rather, the evidence shows that the magnitude of sediment transport processes is dominated by less frequent but more energetic storm events through wave action at the seabed; however, the direction of transport typically remains orientated to the tidal axis. Storms may have a relatively greater or lesser frequency and magnitude of effect in different parts of the Moray Firth as the strength of wave action felt at the bed is moderated by the local water depth and the relative exposure of the particular location.

In the nearshore environment, the rocky inlets and sandy embayments suggests that coastal processes at the coastline will be spatially variable in type and also therefore in response and susceptibility to the potential impacts of the proposed development.

SUSPENDED SEDIMENTS

As outlined in the following section, the strength of the normal tidal regime in the Moray Firth is considered insufficient to drive significant sediment transport alone. Local processes are instead thought to be dominated by nearbed wave action during occasional high-energy storm events. As a result, suspended sediment concentrations (SSC), especially in the upper water column, will be typically low during periods of calm weather and/or in the absence of large swell waves.

However, levels of SSC can also be expected to rise significantly, both nearbed and extending upwards into the water column, during and for a short time after storm events when wave action at the seabed is sufficient to mobilise and resuspend the local sediments. Following a storm event, SSC will gradually decrease (settle out) to a baseline condition, controlled by the ambient regional tidal regime. The degree of local seabed disturbance and the resulting levels of SSC will depend upon the duration and intensity of the storm and the resulting character of the waves that are produced; local variability in SSC may also be observed depending upon the local sediment type (resistance to erosion, tendency to remain in suspension) and water depth (controlling wave attenuation).

There are no known significant fluvial sources of SSC in the outer Moray Firth.

Due to the seasonal nature of the frequency and intensity of storm events, levels of SSC will likely follow a broadly seasonal pattern. It is possible that seasonal blooms of marine organisms may also contribute to seasonality in measurements of total turbidity, but this is not directly associated with resuspension of (inorganic) sediments.

5.1.3 DATA GAPS

The body of available historical data describing the physical environment are not presently of sufficient quantity, quality and resolution to support detailed Environmental Impact Assessment or

the engineering design of the offshore wind farm and certain aspects of the cable route design. To fill these data gaps, more detailed metocean and geophysical survey data has been collected in the vicinity of the main site and additional geophysical data is being collected along the cable corridor. The combined data set will be used to more accurately predict the potential for impacts of the development on known sensitive receptors.

5.1.4 ENVIRONMENTAL IMPACT SCOPING

Based on the available literature, it is considered that the potential impacts on the physical environment as a result of constructing, operating and decommissioning the OFTO infrastructure may include:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Changes to hydrodynamic (wave and tidal) conditions	✓	✓
Changes to the sedimentary environment	✓	✓
Changes to sedimentary structures	✓	✓
Changes to suspended sediment concentrations	✓	✓

Consideration of the above issues will be made with respect to the following spatial scales, as relevant to the proposed cable and offshore substation infrastructure:

- Near-field (i.e. the area within the immediate vicinity of the proposed works); and
- Far-field (e.g. the coastline, sites of scientific and conservation interest).

5.1.4.1 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above, the potentially present sensitive receptors, the surveys or studies required to address outstanding data gaps and a proposed method of impact assessment are described in the tables below. In each case, a more specific list of sensitive receptors relevant to the site will need to be identified via the scoping and stakeholder feedback and agreed in advance with the regulator for consideration in the ES.

Potential Impact	**Changes to hydrodynamic conditions from the offshore substation platforms**
Sensitive Receptors	Potentially sensitive receptors include: - Surfing wave climate on the south coast of the Moray Firth. - Safety of nearby offshore infrastructure affected by modified wave climate. And, if identified during stakeholder engagement:

	- Navigational safety in the vicinity of adjacent ports affected by modified wave climate.
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for impacts on the wave and tidal regime, the following surveys and studies will be undertaken: - Identification of key recreational surfing venues and identification of key port and offshore infrastructure. - Bathymetric surveys - Metocean surveys: ADCP surveys and wave buoys - Computational modelling
Method of Impact Assessment	A more specific list of sensitive receptors will be identified for study. Historical and newly collected survey data will be used to inform conceptual and numerical modelling which will be used in turn to determine the magnitude, extent and significance of changes in the wave climate within the Outer Moray Firth affecting the identified sensitive receptors.

Potential Impact	**Changes to the sedimentary environment & Changes to sedimentary structures**
Sensitive Receptors	Potentially sensitive receptors include: - The form and function of the Moray Firth surficial sediments. - The form and function of the littoral and nearshore zone at the cable landfall. - Sediment transport pathways affecting the form and function of similar adjacent sedimentary systems. - Changes to patterns of coastal sediment transport affecting coastal stability and recreational beach resource. - Loss of habitat due to sediment displacement as a result of scouring around the base of offshore substation platform foundations.
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for impacts on the sedimentary environment during the operational phase of the wind farm, the following surveys and studies will be undertaken: - A more detailed review of sedimentary information including the location of potentially susceptible coastlines in the Moray Firth region and at the cable landfall. - Bathymetric surveys - Side-scan sonar - Benthic survey and review of key habitats present - Metocean surveys: ADCP surveys and wave buoys - Seabed sediment samples & particle size analysis - Suspended sediment concentration monitoring - Computational modelling
Method of Impact Assessment	A more specific list of sensitive receptors will be identified for study. Historical and newly collected survey data will be used to inform conceptual and numerical modelling which will be used in turn to determine the magnitude, extent and significance of changes in the sedimentary environment affecting the identified

	sensitive receptors.

Potential Impact	**Changes to suspended sediment concentrations**
Sensitive receptors	Potentially sensitive receptors include: - Habitats and ecosystems sensitive to modification of the naturally present levels of suspended sediment or rates of sediment deposition (if found to be present).
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for changes to normal patterns and levels of suspended sediment concentration during the construction (foundation and cable installation) and operational phases of the wind farm development, the following surveys and studies will be undertaken: - Benthic ecology surveys - Bathymetric surveys - Side-scan sonar - Metocean surveys: ADCP surveys and wave buoys - Seabed sediment samples & particle size analysis - Suspended sediment concentrations - Sub-bottom geophysical survey and vibro-coring - Computational modelling
Method of Impact Assessment	A more specific list of sensitive receptors will be identified for study on the basis of the benthic surveys, informed by the detailed bathymetric and side-scan sonar surveys. If sensitive receptors are found to be present, historical and newly collected survey data will be used to inform conceptual understanding in conjunction with numerical modelling which will be used in turn to determine the magnitude, extent and significance of changes in the typical levels of suspended sediment concentration and their potential for re-deposition.

The following issues have been considered and are scoped out of the proposed study:

- Due to the presence of only a thin layer of mobile Holocene sediments overlying erosion resistant sedimentary units on the Smith Bank, it is considered that there will be no significant impact of the offshore substation foundations on the underlying geology of the main wind farm site or the regional bathymetry. In other locations along the export route, the cable will be buried or will present only a small local obstruction at the surface (similar in scale to naturally occurring bedforms) and therefore presents little or no risk of causing gross morphological change. Therefore, these subject areas have been **scoped out**.
- Where the cable is buried, presenting no obstacle to nearbed water flow, it is considered that there will be no significant impact on the tidal or wave regimes, and therefore no significant impact on coastlines, sediment transport pathways or navigational safety, either near to the cable infrastructure or in the surrounding area. Therefore, this subject area has been **scoped out**.
- The presence of UXO is not considered as a potential impact to the environment but will be considered a potential impact to the safety of the construction programme.

5.1.4.2 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT

Cumulative impacts arise where the footprints of potential impacts (e.g. areas of reduced wave height or tidal current speed) of two or more simultaneously present developments overlap, resulting in a greater potential impact locally.

In-combination impacts may arise where the footprint of temporary impacts (e.g. plumes of suspended sediment) from two or more simultaneously occurring operations overlap, resulting in a greater potential impact locally. Operations with the potential to result in in-combination effects may also include other marine operations unrelated to the wind farm construction such as cable or pipe laying and dredging.

There is foreseeable potential for the extent or magnitude of environmental impacts identified in the previous sections to be cumulatively increased by the simultaneous presence of the Beatrice offshore wind farm offshore transmission infrastructure and the proposed SHETL cable.

The extent to which in-combination effects may arise, will depend upon the anticipated construction schedules of the Moray Firth Round 3 offshore generating stations, the Beatrice offshore wind farm and the proposed offshore hub. No other regular activities with potential to cause in-combination effects were identified in the Outer Moray Firth apart from possible future oil and gas developments (see section 5.3.6).

The methodologies with which cumulative and in-combination effects will be assessed are described in the Moray Firth Offshore Wind Developers Group Cumulative Impacts Assessment Discussion Document (ERM, 2011a).

5.1.4.3 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The survey designs will take into consideration industry best practice for each survey type and best practice survey/data requirements to inform upstream modelling and analysis methods which are foreseeably part of EIA. These will ensure both a sufficient quantity and quality of data are collected:

- Marine Guidance Note MGN 371 (compliance with International Hydrographic Organisation (IHO) Order 1 standards)
- CEFAS (2004)*. Offshore Wind Farms – Guidance note for Environmental Impact in respect of FEPA and CPA requirements.
- COWRIE (2009) Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guide. Eds: Lambkin, D.O., Harris, J.M., Cooper, W.S., Coates, T.
- SUT (2005). Guidance Notes on Site Investigation for Offshore Renewable Energy Projects (UK Society for Underwater Technology (SUT)
- JNAPC (2006). JNAPC Code of Practice for Seabed Development – Joint Nautical Archaeology Policy Committee

*This guidance is expected to be revised in 2010 to account for the potential impacts of the Round 3 offshore wind farm programme.

5.1.4.4 SUMMARY OF METHODOLOGY

GEOPHYSICAL SURVEYS

Geophysical surveys for the offshore cable route commenced in July 2011 and are expected to be complete by mid September2011.

An analogue survey shall be undertaken to provide data on bathymetry, seabed features, and sub-bottom conditions to at least 5m depth below seabed for input to the Trenching Specification and Burial Protection Assessment (BPA).

The geophysical survey will therefore be conducted using swathe bathymetry, side scan sonar, sub-bottom profiler and magnetometer along the proposed cable route. The seabed hydrographic and geophysical data will also provide the basis for benthic ecology and marine archaeology assessments and input to the environmental programme. Geophysical surveys are executed using remote sensing equipment that is either installed on the hull of the vessel or towed below the vessel but above the sea bed. A 'picture' is built up of the seabed geophysical conditions as the vessel transits across the sea surface. In order to efficiently cover the seabed surface the survey area is covered by transiting in lines, the spacing of which is dependent on the water depth.

GEOTECHNICAL SURVEYS

Geotechnical surveys will be used to establish ground truth against which geophysical data can be correlated and to determine and quantify surficial and sub-surface sedimentary conditions. Following the execution of the detailed geophysical survey, and the integration of the results into a geo-spatial model, the number of geotechnical sampling locations will be finalised in order to define the seabed structure along the route.

For cable routes, a sufficient number of samples shall be obtained from each surface seabed unit along the route(s) to identify and classify the material aiding the assessment of installation requirements. Such testing will serve to confirm the nature of the surficial soils, archaeological features and further reduce the installation risk.

Shallow geotechnical testing will be carried out at strategically selected intervals, at locations to be selected from the results of the analogue survey. The shallow geotechnical sampling programme is designed to provide information on soil properties in the top 5m below seabed. It should be noted that there will not be any boreholing undertaken.

The following tools shall be used in the geotechnical surveys:

- 5m vibrocorer to obtain samples of Holocene or near-surface Quaternary soils for laboratory analysis
- 5m Piezocone Penetration Tests (PCPT) to determine geotechnical properties of the soils.

Vibrocore and PCPT stations shall be co-located within a few metres of each other.

METOCEAN SURVEYS AND MODELLING

The metocean campaign commenced in June 2010 and was completed in May 2011. The campaign includes one directional wave buoy and four seabed frames each with an acoustic doppler current profiler (ADCP, measuring wave climate, tidal height and tidal current profiles), an optical backscatter device (OBS, measuring suspended sediment concentration) and a static sediment trap. The wave, tidal and turbidity data that was collected will be used to inform and validate coastal process models of the area. A limited amount of seabed sediment sampling will also be undertaken at the locations of the deployed devices in addition to other seabed sampling programmes. The wave buoy was be in the water until a representative range of typical conditions were successfully observed (including calm and storm events and at least one 1 in 1 year event from each of the three characteristic wave fetch sectors). The seabed frames will be deployed for a minimum of 29 consecutive days to provide at least two full neap-spring tidal cycles of concurrent tide, wave and turbidity data. Figure 5-4 illustrates the locations of the equipment.

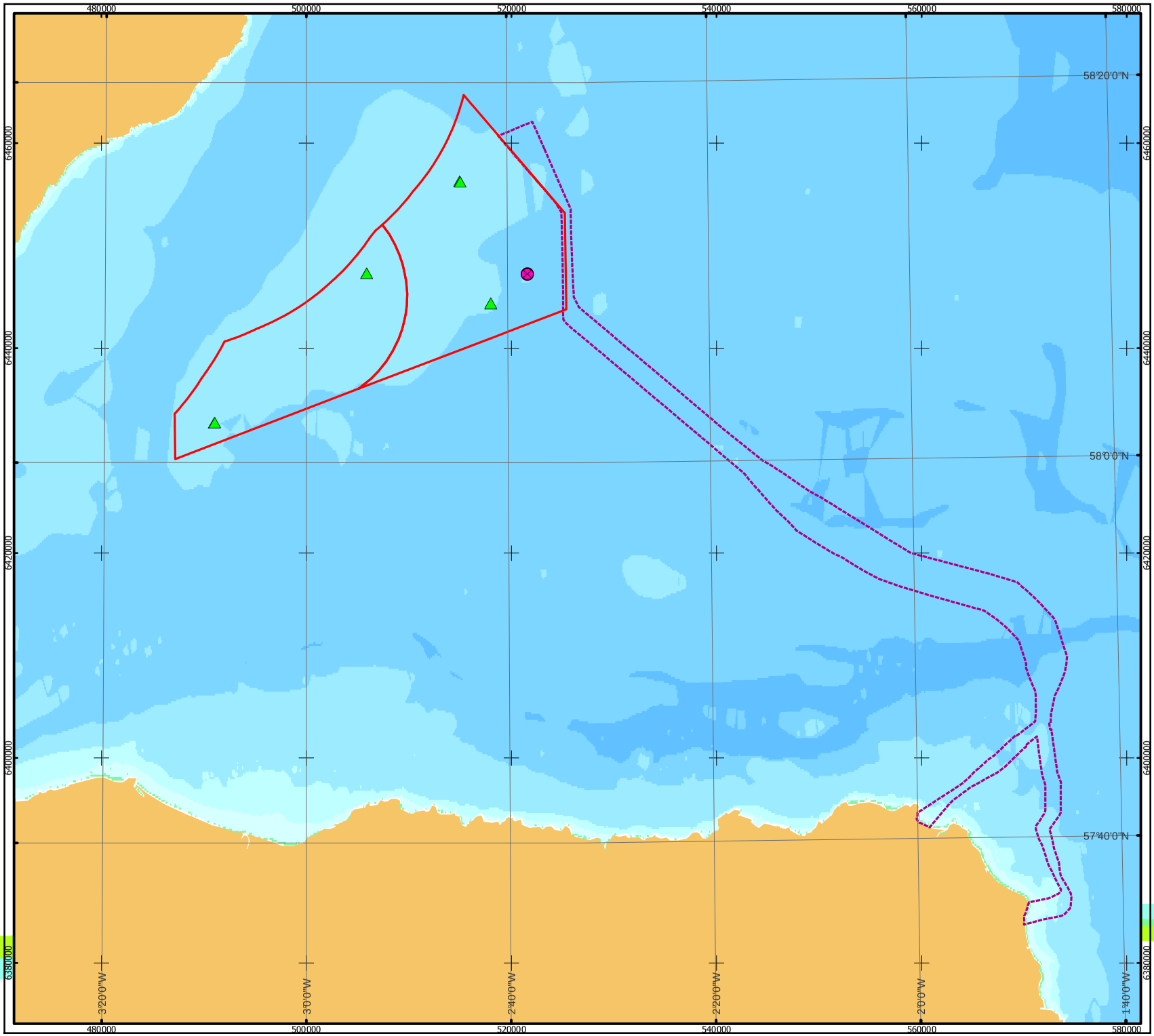
A numerical model of coastal process and metocean conditions will be designed and applied within the study according to best practice guidance for numerical modelling in relation to EIA for offshore wind farms (COWRIE, 2009). Once suitably calibrated and validated using the measured data from the wind farm sites, together with historical data available for other locations along the cable route, the numerical model can be used to inform assessments at any location along the route of the magnitude and significance of impacts to any sensitive receptors identified, caused directly by changes to the following environmental processes:

- Hydrodynamics (e.g. wave climate, tidal regime);
- Sedimentary environment (e.g. sediment composition and particle size, sediment re-suspension, sediment transport pathways and sediment deposition);
- Sedimentary structures (e.g. channels, banks); and
- Suspended sediment concentrations (SSCs).

The results of the physical modelling will also be used to inform the following associated impact assessments:

- Benthic ecology
- Fish
- Nature conservation
- Offshore archaeology and culture heritage
- Offshore recreation
- Potential cumulative and in-combination impacts

Meteorology (primarily wind) data is expected to be collected from a combination of methods, such as onshore met masts and weather stations, offshore based LiDAR and, later in the development programme, an offshore met-mast.



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- AWACs
- Wave Buoys

Horizontal Scale: 1:500.000 A4 Chart

0 5.000 10.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-026

Fig:5-4 Metocean Survey Equipment Deployed in the MORL Zone

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5.1.4.5 POTENTIAL MITIGATION METHODS

Potential mitigation measures associated with changes to the sedimentary environment include the type and design of offshore substation platform substructure and foundation, the use of scour mats around bases and the choice of construction techniques, including installation of foundations and cable burial.

The mitigation measures proposed in the final ES will be dependent upon the infrastructure choices available after the preliminary front end engineering design (FEED) work (which will be influenced by engineering properties of the area and the cost of materials) and the potential impacts to sensitive receptors found to be present, as determined by the EIA scoping and further studies. Options of mitigation will be discussed with the relevant authorities prior to submission of the ES.

5.1.5 UNDERWATER NOISE

During the development of the offshore transmission infrastructure a number of possible sources of underwater noise may be present in the region. These will be related to the construction of the offshore substation and the laying of the offshore section of the transmission cable.

Some offshore construction operations are known to generate high levels of underwater noise that may be of sufficient level to impact local marine life, in particular fish and marine mammals. Specific information relating to the EIA scope for these animals are presented in the relevant sections of this document (sections 5.2.3 and 5.2.4). This section provides some additional specific detail relating to the proposed approach to underwater noise assessment.

5.1.5.1 BASELINE ENVIRONMENT

Factors affecting the pre-existing baseline levels of underwater noise in the region typically relate to activities such as:

- Shipping;
- Metocean conditions;
- Oil and gas activities; and
- Leisure craft.

5.1.5.2 DATA GAPS

The levels of underwater noise from these activities can often be characterised by reviewing measured underwater noise data from similar activities and carrying out simple modelling to better understand the impact in a specific region. A review of the available information will be carried out.

5.1.5.3 ENVIRONMENTAL IMPACT SCOPING

Based on the available information, the following are perceived to be the potential impacts relating to underwater noise generated by the proposed OFTO infrastructure:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Behavioural disturbance or physical injury to marine species as a result of increased levels of underwater noise	✓	✓

Activities related to the construction, operation and maintenance of the OFTO infrastructure that may generate increased levels of underwater noise include but may not be limited to:

- Impact piling or drilling of foundations for the offshore substation
- Trenching of cables
- Vessel activity

5.1.5.4 SITE SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below.

Potential Impact	Behavioural disturbance or physical injury to marine species as a result of increased levels of underwater noise
Sensitive Receptors	Potentially sensitive receptors include: - Marine mammals - Fish
Survey/Study Proposed to Assess Impact	To determine the potential for behavioural disturbance and physical injury as a result of underwater noise, the following surveys and studies will be undertaken: - Desk based information and literature review of offshore activities and available data relating to underwater noise from these activities - Computational modelling
Method of Impact Assessment	Previously measured underwater noise data from similar sources of underwater noise will be reviewed along with any site specific data recorded during additional surveys. These data will be analysed to determine the magnitude and extent of potential impacts to marine species or species groups from these activities. Detailed site specific computational modelling will be undertaken to estimate the impacts on local key species.

5.1.5.5 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE

There is currently no best practice guidelines specific to the modelling of underwater noise for the EIA process. However, two publications may be applicable to the assessment of underwater noise impact on marine life and the measurement of underwater noise from vessels. These are:

- Joint Nature Conservation Committee (JNCC), Natural England and Countryside Council for Wales. (2010). The protection of marine European Protected Species from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area, June 2010

- For the measurement of noise from vessels, the guidance set out in ANSI, S12.64, Quantities and Procedures for Description and Measurements of Underwater Sound from Ships, Acoustical Society of America, 2009, will be considered.

5.1.5.6 SITE SPECIFIC UNDERWATER NOISE MODELLING METHODOLOGY

The marine species of interest to the study area will be defined by the relevant specialists; further scoping information on this can be found in the appropriate sections in this document. The purpose of this section is to provide details of the intended approach to underwater noise prediction that will provide the data required to assess the impact of underwater noise on various marine species.

INFORMATION AND LITERATURE REVIEW

Initially, a review of the available information relating to the various processes involved in the offshore transmission works will be carried out. This will include details such as specification of equipment used, materials, vessel specification and any other relevant information that is available.

A literature review will then be carried out to determine if any information exists that could indicate the levels of underwater noise that may be generated during these activities.

RANK ORDERING OF NOISE SOURCES

Where underwater noise data of sufficient quality are available, these will be used to rank order the noise sources in terms of potential impact to marine species. This will allow sources of underwater noise that are judged to be of a sufficiently low level to have negligible impact to be removed from further consideration.

DETAILED NOISE MODELLING

Modelling of underwater noise will then be carried out to estimate the potential impact of the remaining noise sources on marine species. Various noise propagation models are available for this purpose so the most appropriate model will be used for the intended purpose (the modelling approach of the OFTO infrastructure will be aligned with the wind farm assessment, currently in consultation with the Statutory Nature Conservation Agencies, SNCAs).

The output of the noise modelling exercise will be in the form of impact zone contour plots showing the zone around the activity within which various effects are likely to occur to marine species. A critical part of the process is to analyse the noise in a way that will indicate its potential for environmental effect. That is, to assess the environmental effect of noise, the modelled data must be interpreted and processed in a biologically significant way.

The high levels of underwater noise generated during some offshore construction operations have the potential to cause both physical and behavioural effects in species of fish, marine mammals and diving birds. These can be summarised as:

- **Lethal Effect -** At very close range from the source the peak pressure levels have the potential to cause death, or severe injury leading to death, in marine mammals, fish and diving birds.
- **Physical Injury -** At greater range, underwater noise can cause physical injury to organs such as the lungs, liver, intestines, and other soft tissues surrounding gas containing structures of the body.

- **Hearing Impairment -** At high enough sound levels and particularly where there are repeated high level exposures from activities such as impact piling, the underwater sound has the potential to cause hearing impairment in marine species.
- **Behavioural Response -** At greater range the underwater sound wave may not directly injure animals, but has the potential to cause behavioural disturbance. This effect is slightly harder to predict as there are many other factors that may influence whether an animal will react to a sound or not. Factors such as age, sex or a strong compulsion to enter an ensonified area may determine whether or not a particular individual will react to a sound. Metrics have, however, been developed to inform an assessment of the likelihood of a particular animal reacting to a sound.

A number of metrics have been proposed for the assessment of the impact of underwater noise on marine species. Details of the metrics most commonly used and their application to the EIA process can be found in the following documents:

- Nedwell J R, Turnpenny A W H, Lovell J, Parvin S J, Workman R, Spinks J A L, Howell D (2007). A validation of the dBht as a measure of the behavioural and auditory effects of underwater noise. Subacoustech Report Reference: 534R1231, Published by Department for Business, Enterprise and Regulatory Reform
- Joint Nature Conservation Committee (JNCC), Natural England and Countryside Council for Wales. (2010). The protection of marine European Protected Speceis from injury and disturbance: Guidance for the marine area in England and Wales and the UK offshore marine area, June 2010
- Southall, Brandon L.; Bowles, Ann E.; Ellison, William T.; Finneran, James J.; Gentry, Roger L.; Greene, Charles R.; Kastak, David; Ketten, Darlene R.; Miller, James H.; Nachtigall, Paul E.; Richardson, W. John; Thomas, Jeanette A.; Tyack, Peter L, (2007) Marine Mammal Noise Exposure Criteria Aquatic Mammals, Vol 33 (4)

The field of underwater noise impact assessment is constantly changing as our understanding improves. Therefore, other criteria and any update to the metrics presented in the above sources will be considered in the assessment, where appropriate.

5.1.5.7 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

The potential for cumulative impact will be assessed by review of the construction schedule. Where activities related to the OFTO infrastructure are likely to occur at the same time, the cumulative impact will be assessed.

Due to a number of other projects in the Moray Firth region, in particular the construction of other offshore wind farms, subsea cables and oil and gas activities, in-combination impacts are possible. A review of the available scheduling information will be carried out and the likelihood and extent of any increase in impact will be assessed.

The MFOWDG Cumulative Impacts Assessment Discussion Document (see section 3) and associated consultation responses recognise the importance of the underwater noise modelling in the assessment of potential impacts on marine fauna, specifically marine mammals, fish and diving birds. A similar approach will be followed for the cumulative impact assessment associated with MORL and BOWL's offshore transmission infrastructures.

5.1.5.8 POTENTIAL MITIGATION METHODS

A number of possible mitigation strategies will be considered in the EIA, such as best practice guidance and monitoring protocols as well as potential site specific methods.

5.1.6 PHYSICAL ENVIRONMENT (ONSHORE)

The physical environment receptors are categorised as follows:

- Superficial and Solid Geology
- The Water Environment
- Human Health

5.1.6.1 BASELINE INFORMATION

GEOLOGY
Available geological data indicates that superficial deposits expected to underlie the route corridor will include (Figure 5-5):

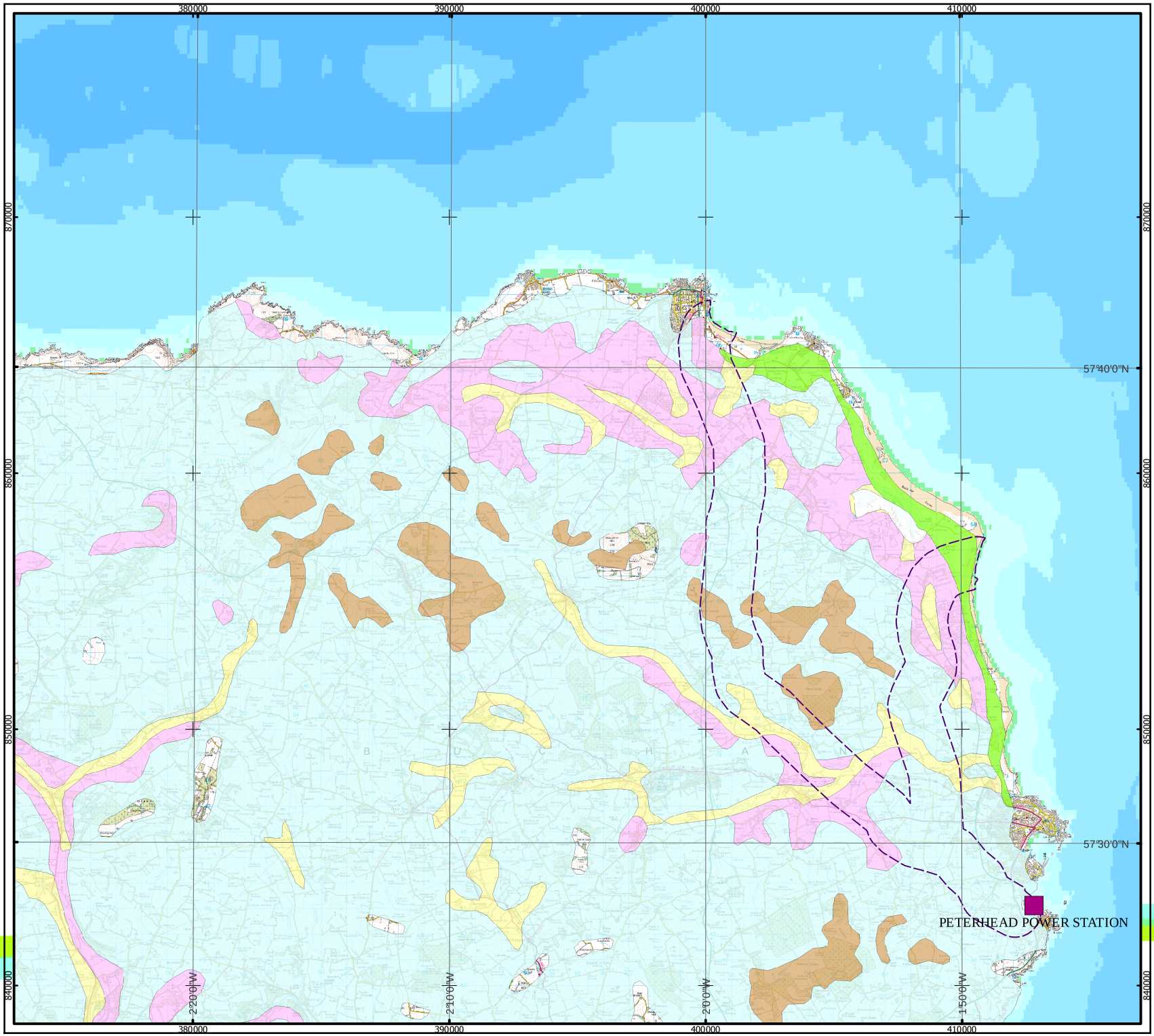
- glacial sands and gravels;
- till;
- alluvium;
- blown sand; and
- localised pockets of peat.

It is recognised that the proposed route corridor intersects localised deposits of peat. Given the ecological importance of such deposits and the difficulties associated with construction in peat land, it is proposed that localised surveying of peat depth and condition will be required to inform the EIA and the geotechnical design of the cable route.

The solid geology of the Banff and Buchan area generally comprises psammites, semipelites and pelites of the Argyll Group with isolated pockets of Argyll Group quartzite (Figure 5-6). The following igneous intrusions are anticipated within the area of the proposed route corridor:

- late Silurian to early Devonian felsic rock;
- Ordovician to Silurian felsic rock; and
- dykes of Carboniferous to Permian dolerite and tholeiitic basalt.

Two geological Sites of Special Scientific Interest (SSSI) are identified within the proposed route corridor, these are:



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- OFTO Onshore Study Area

SUPERFICIAL GEOLOGY

- ALLUVIUM
- BLOWN SAND
- GLACIAL SAND AND GRAVEL
- PEAT
- TILL
- DRIFT GEOLOGY (NOT MAPPED)

Horizontal Scale: 1:200.000 A4 Chart

0 2.500 5.000 Meters

N

Geodetic Parameters: British National Grid (OSGB36)

Produced: RH
Reviewed: CR
Approved: CR

Date: 10/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-011

Fig: 5-5 Onshore Superficial Sediments

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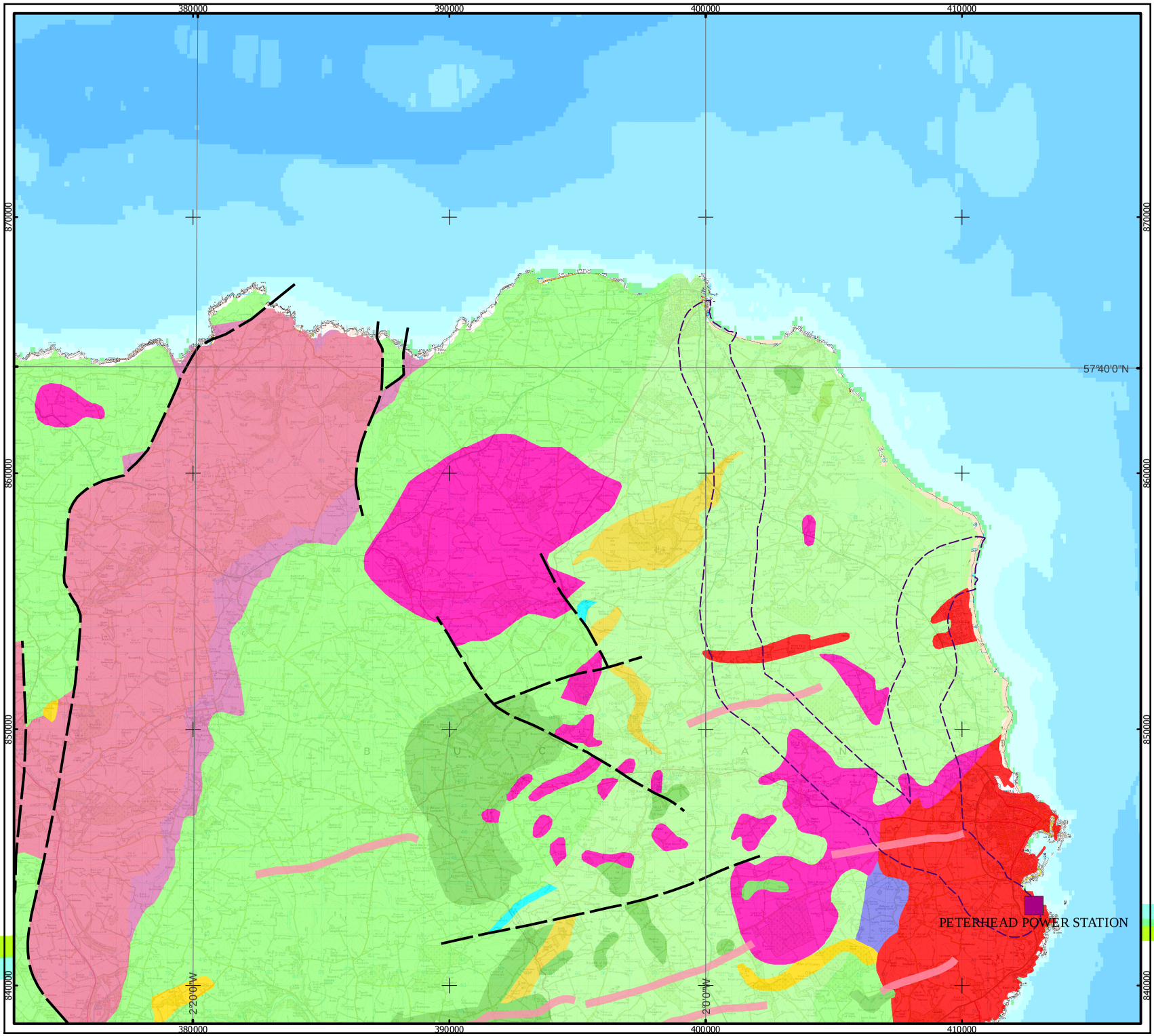

edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- OFTO Onshore Study Area

FAULTS

- Fault at rockhead
- Thrust Fault; barbs on hanging wall side

DYKES

- UNNAMED IGNEOUS INTRUSION, CARBONIFEROUS TO PERMIAN - DOLERITE AND THOLEIITIC BASALT

BEDROCK

- NEOGENE ROCKS (UNDIFFERENTIATED) - GRAVEL, SAND, SILT AND CLAY
- MIDDLE OLD RED SANDSTONE (UNDIFFERENTIATED) - CONGLOMERATE, SANDSTONE, SILTSTONE AND MUDSTONE
- LOWER OLD RED SANDSTONE - CONGLOMERATE, SANDSTONE, SILTSTONE AND MUDSTONE
- UNNAMED IGNEOUS INTRUSION, LATE SILURIAN TO EARLY DEVONIAN - FELSIC-ROCK
- UNNAMED IGNEOUS INTRUSION, ORDOVICIAN TO SILURIAN - FELSIC-ROCK
- UNNAMED IGNEOUS INTRUSION, ORDOVICIAN TO SILURIAN - MAFIC IGNEOUS-ROCK
- ARGYLL GROUP - METALIMESTONE
- ARGYLL GROUP - PSAMMITE, SEMIPELITE AND PELITE
- ARGYLL GROUP - QUARTZITE
- SOUTHERN HIGHLAND GROUP - PELITE
- SOUTHERN HIGHLAND GROUP - PSAMMITE AND PELITE
- UNNAMED IGNEOUS INTRUSION, NEOPROTEROZOIC - MAFIC IGNEOUS-ROCK

Horizontal Scale: 1:200.000 A4 Chart

0 2.500 5.000 Meters

N

Geodetic Parameters: British National Grid (OSGB36)

Produced: RH
Reviewed: CR
Approved: CR

Date: 10/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-010

Fig: 5-6 Onshore Bedrock Geology

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- Site 872 – Kirkhill (NGR: NK012526): The site represents the most complete stratigraphic record of Middle to Late Quaternary deposits in Scotland and is considered a unique site of the very highest importance for Quaternary studies in Scotland.

- Site 1040 - Loch of Strathbeg (NGR: NK075590): A key geomorphological site for its extensive and varied dune topography. The site also provides interest by a variety of raised shoreline features and is considered an outstanding site for studies in coastal geomorphology.

HYDROGEOLOGY

The published Hydrogeological Map of Scotland, 1988, 1:625 000 indicates that the region in which the site is located is underlain by concealed aquifers of limited potential or without significant groundwater with localised areas with locally important aquifers in which intergranular flow is significant.

Locally important aquifers are contained within areas of blown sand (coastal dune systems) and areas of quaternary sands and gravels.

The Groundwater Vulnerability Map of Scotland (1995), 1:625 000 indicates that the region in which the proposed route corridor is located is underlain by weakly and moderately permeable strata. The superficial deposits are considered to be of low leaching potential and may restrict migration of contaminants where present. It is noted that the leaching potential of soils may increase in localised areas where soils are granular and of increased permeability. Groundwater vulnerability for the region is generally assessed as low.

The route corridor is identified as being located within a Groundwater Bodies Drinking Water Protected Area as identified by the water quality maps issued by SEPA and the Scottish Executive in 2005 (Map 21). Additionally, it is identified that the route corridor transects a Surface Water Drinking Water Protected Area at the River Ugie to the west of Peterhead (Map 10).

HYDROLOGY

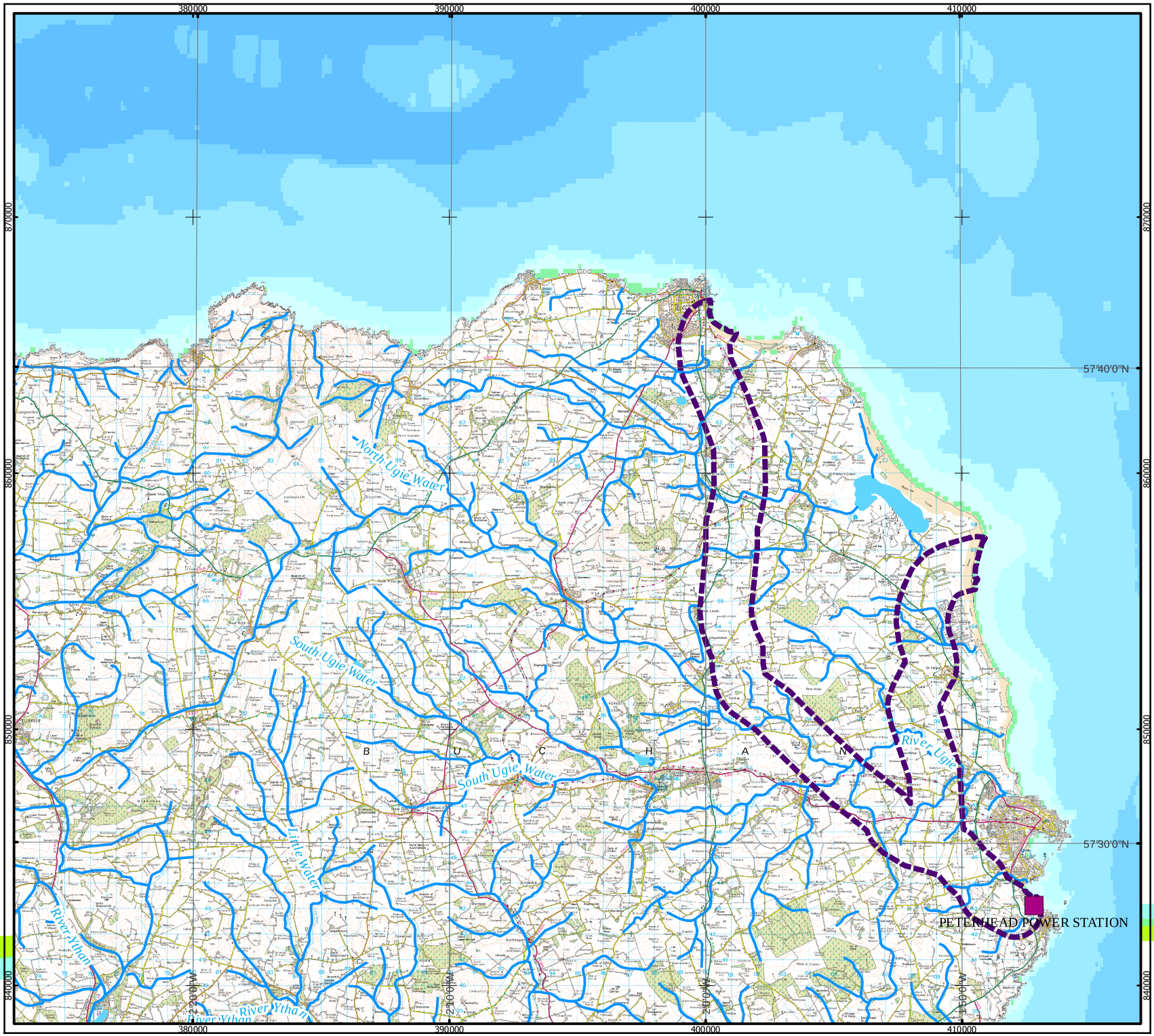
The proposed route corridors are identified as being transected by various burns, streams and rivers (Figure 5-7). The River Ugie catchment is the largest catchment intersected by both routes. The main tributaries within this catchment which require crossing by either of the proposed routes are the North Ugie Water, the South Ugie Water and the Burn of Faichfield. Other significant watercourses within the study area are the Black Water, the Water of Philorth and the College Burn near Fraserburgh.

Although not directly within the study area, the Loch of Strathbeg, an SPA, Ramsar Site, SSSI and RSPB nature reserve, is located downstream of some of the watercourses intersecting the cable route between Peterhead and Fraserburgh (see section 5.2.6 Terrestrial Ecology, and Figure 5-14). Any potential impact on the water quality in this loch, for example during construction, will be considered.

The two options for coastal landfall points of the cable are located at Fraserburgh Beach or Rattray and of importance is the potential risk of flooding at these locations. The risk of flooding at the onshore substation location will also be considered.

MINERAL EXTRACTION

Given the geological strata identified along the route corridor, no coals reserves are evident within the region; as such the potential for the sterilisation of such mineral resources is limited.



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- OFTO Onshore Study Area
- Rivers
- Lakes

Horizontal Scale: 1:200.000 A4 Chart

0 2.500 5.000 Meters

N

Geodetic Parameters: British National Grid (OSGB36)

Produced: RH
Reviewed: CR
Approved: CR

Date: 10/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-012

Fig: 5-7 Hydrology

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It is acknowledged that sand and gravel deposits are locally present which have the potential to be economically viable, and as such the potential impact of the development upon them will considered further.

LAND CONTAMINATION

At present there is not sufficient information to identify if there are areas of potentially contaminated land within or adjacent to the proposed route corridor.

5.1.6.2 DATA GAPS

The geo-environmental baseline data presently available describing conditions underlying the proposed route corridor are not of sufficient quality to support either detailed Environmental Impact Assessment or the engineering design of the onshore cable route corridor. Therefore, a more detailed study will be required to provide this information. The combined data set will be used to more accurately predict the potential for impacts of the development on known sensitive receptors.

The studies to expand the baseline data and assess potential impacts are provided in the following sections.

5.1.6.3 ENVIRONMENTAL IMPACT SCOPING

Based on the available literature, it is considered that the potential impacts to the onshore physical environment as a result of constructing the OFTO infrastructure may include:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Damage to geological features/designated sites.	✓	Unknown
Alteration/modification of the hydrological/hydrogeological regime of the region and associated receptors.	✓	Unknown
Disturbance of contaminated materials/soil gases and the subsequent generation of potentially contaminated waste materials and impact upon construction materials and workers.	✓	Unknown
Construction phase activities impacting on the Water Environment (e.g. spillages, use of chemicals, sedimentation).	✓	Unknown

Consideration of the above issues will be made with respect to route corridor options within the onshore export cable route study areas.

5.1.6.4 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above, the potentially present sensitive receptors, the surveys or studies required to address outstanding data gaps and a proposed method of impact assessment are described in the tables below. In each case, a more specific list of sensitive receptors relevant to the site will need to be identified via the scoping and stakeholder feedback and agreed in advance with the regulator for consideration in the ES.

Potential Impact	**Damage to geological features/designated sites during construction.**
Sensitive Receptors	Potentially sensitive receptors include: - Geologically important formations/sites including SSSIs (Site 872 and Site 1040). - Coastal dune systems by displacement/erosion. - Peat. - Reserves of extractable minerals/deposits.
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for impacts on geological features, the following surveys and studies will be undertaken: - Phase I Desk Study. - Consultations with SNH and RIGS groups. - Peat depth survey.
Method of Impact Assessment	A more specific list of sensitive receptors will be identified for study. Historical and newly collected survey data will be collated to inform conceptual modelling which will be used in turn to determine the requirement for further investigation and/or mitigation. An initial peat depth survey will be undertaken to determine the extent of deposits within the proposed route corridor. This will inform the development of the construction management plan and route selection.

Potential Impact	**Alteration/modification of the hydrological/hydrogeological regime of the region, including:** - **Run-off/flow patterns and associated flooding during construction and operation.** - **Erosion and sedimentation of surface water courses during construction.** - **Contamination via the use/spillage of chemicals/fuels/oils during construction and operation.**
Sensitive Receptors	Potentially sensitive receptors include: - Surface/groundwater bodies. - Private/public water supplies.
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for alteration of the hydrological/ hydrogeological regime, the following surveys and studies will be undertaken:

	- Phase I Desk Study. - Identification of public/private water supplies. - Flood Risk Assessment (if required). - Identification of water courses, sensitivity and over-land flow paths.
Method of Impact Assessment	A more specific list of sensitive receptors will be identified for study. Historical and newly collected survey data will be collated to inform conceptual modelling which will be used in turn to determine the potential for alteration of the hydrological/hydrogeological regime.

Potential Impact	**Disturbance of contaminated materials/soil gases and the subsequent generation of potentially contaminated waste materials.**
Sensitive Receptors	Potentially sensitive receptors include: - Human health (nearby residents, users and construction workers). - The Water Environment including private/public water supplies. - Construction materials.
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for the presence of contaminated material, the following surveys and studies will be undertaken: - Phase I Desk Study.
Method of Impact Assessment	Desk study research will identify the presence of potentially contaminated sites (if applicable) which could affect the development of the route corridor. Based on the findings of this study, a more specific list of sensitive receptors will be identified for impact assessment. Historical and newly collected survey data will be collated to inform conceptual modelling which will in turn be used to inform the requirement for further investigation and/or risk assessment and mitigation.

Potential Impact	**Construction phase activities, including:** - **Material excavation/foundation construction.** - **Erosion and sedimentation of surface watercourses as a result of the construction of substation and activities associated with cable burial.** - **Contamination via the use/spillage of chemicals/fuels/oils.**
Sensitive Receptors	Potentially sensitive receptors include: - The Water Environment including private/public water supplies. Human health (nearby site residents, site users and construction workers).
Survey/Study Proposed to Assess Impact	To inform studies to determine the potential for impact from specific construction activities, the following surveys and studies will be undertaken: - Phase I Desk Study. - Hydrological studies including identification of watercourses, flow paths, flood risk, identification of water supplies, water quality and river sensitivity.
Method of Impact Assessment	A more specific list of sensitive receptors will be identified for study. Historical and newly collected survey data will be collated to inform conceptual modelling which will be used in turn to inform the development of the construction management plan and route selection.

5.1.6.5 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT

The desk research would consider other development activities in proximity to the route, or proposed changes at Peterhead Power Station that could result in cumulative or in-contribution effects. It is however envisaged that cumulative and in-combination effects are unlikely in the onshore environment.

5.1.6.6 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

- A Handbook on Environmental Impact Assessment, (Scottish Natural Heritage (SNH) 2005).
- Assigning groundwater assessment criteria for pollutant inputs, WAT-PS_10_01 SEPA V2. May 2011.
- CIRIA (2005). Construction Industry Research and Information Association (CIRIA) (2005): C650: Environmental Good Practice on Site.
- CIRIA C502 Environmental Good Practice on Site.
- CIRIA C515 Groundwater Control - Design and Practice.
- CIRIA C521 Sustainable Urban Drainage Systems Design Manual for Scotland and England.
- CIRIA C532 Control of Water Pollution from Construction Sites.
- CIRIA 552: Contaminated Land Risk Assessment – A Guide to Good Practice (CIRIA 2001).
- CIRIA C648 Control of Water Pollution from Linear Construction Projects.
- CIRIA C650 Environmental Good Practice on Site (Expansion of C502).
- CIRIA C665 Assessing Risks Posed by Hazardous Ground Gases to Buildings, 2006.
- CIRIA C682: The VOCs Handbook. Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination. CIRIA 2009.
- CIRIA C689 Culvert Design and Operation Guide.
- Code of Practice for Site Investigations, British Standards Institute BS 5930, Amendment 2, 2010).
- Construction (Design and Management) Regulations (CDM) (2007). Office of Public Sector Information (OPSI).
- Design Manual for Roads and Bridges, Volume 11.
- Draft River Basin Management Plan for the Scotland River Basin District, SEPA.
- EIA (Scotland) Regulations 1999.
- Engineering in the Water Environment, Good Practice Guide, Temporary Construction Methods, 1st Edition, SEPA, March 2009.
- Engineering in the Water Environment, Good Practice Guide, Construction of River Crossings, 1st Edition, SEPA, April 2008.
- Environmental Protection Act 1990: Part IIA Contaminated Land Statutory Guidance: Edition 2, Scottish Executive, May 2006, Paper SE/2006/44.
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment 2004, updated 2005 and 2006).
- Investigation of potentially contaminated sites, code of practice, British Standards Institute, BS 10175: 2001.
- Managing River Habitats for Fisheries, SEPA, 2002.
- Methodology for the Water Framework Directive, SNIFFER, Project WFD 28 Final Report 2004.
- No.19 Groundwater Protection Policy for Scotland.
- -Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments, Scottish Executive, December 2006.

- Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments, Scottish Executive, December 2006.
- Planning Advice Notes.
- Planning Advice Note 33: Development on Contaminated Land, Scottish Executive, October 2000.
- PPG1 General Guide to the Prevention of Water Pollution.
- PPG2 Above Ground Oil Storage Tanks.
- PPG5 Works in, Near or Liable to Affect Watercourses.
- PPG6 Working at Construction and Demolition Sites.
- PPG8 Safe Storage and Disposal of Used Oil.
- PPG21 Polluting Incident Response Planning.
- Pollution Prevention and Control (Scotland) Regulations 2000 – PPC Technical Guidance Note 2, Content and Scope of Site Reports; SEPA; June 2006.
- Private Water Supplies: Technical Manual, Scottish Executive, 2006.
- Protection of Workers and the General Public during the Development of Contaminated Land (HSE 19991).
- PS-06-02 Culverting of Watercourses.
- River Crossings and Migratory Fish: Design Guidance, A Consultation Paper, The Scottish Executive.
- Scottish Planning Policy (February 2010) - replacing (SPP) 6 Renewable Energy (2007).
- Scottish Planning Series Planning Circular 8-2007: The Environmental Impact Assessment (Scotland) Regulations 1999, Scottish Executive.
- SNH: A Handbook on Environmental Impact Assessment. 2006.
- Special Requirements for Civil Engineering Contracts for the Prevention of Pollution, Version 2, SEPA, 2006.
- Supporting Guidance, Environmental Standards for Discharges to Surface Waters, WAT-SG-53, SEPA V3.1, August 2010.
- The National Waste Strategy 1999.
- The Water Environment (Controlled Activities) Regulations (Scotland) 2005. Office of Public Sector Information (OPSI).
- Town and Country Planning (Environmental Impact Asessment) (Scotland) Regulations 2011.
- UK Technical Advisory Group on the WFD, UK Environmental Standards and Conditions (Phase 2), Final, March 2008.
- Water Environment and Water Services (Scotland) Act 2003.
- Water pollution arising from land containing chemical contaminants, SEPA Edition 2, 2009.

5.1.6.7 SUMMARY OF METHODOLOGY

PHASE I DESK STUDY

A Phase I desk-based assessment, complimented by a site visit will be completed to establish all baseline information pertaining to the geological, hydrological, hydrogeological and any contaminated land conditions within the proposed route corridor and will consider the degree to which the underlying ground has been contaminated by historic or current uses. This will highlight potential risks to human health and the wider environment as a result of activities associated with the cable burial and onshore substation construction (including maintenance/repair activities and decommissioning).

The assessment will follow a phased approach to determine the nature of any potential impact to the proposed route corridor, landfall points and substation locations, and will include:

- Identification of current guidance, standards and methodologies for establishing baseline geological, hydrogeological, hydrological and contamination characteristics;

- Collation of information associated with existing ground conditions along the proposed route corridor and the immediate surrounding landscape through the study of previous investigations, published maps and data (including work undertaken on behalf of the local authority and others), and liaison with the landowners/managers and regulatory bodies along the route. Any available existing reports/data sources affecting the route will be reviewed and their adequacy for the purpose of the planning application will be determined. Any gaps in the information should be identified, especially where potential sources of contamination on adjacent land are suspected;

- Consultation with stakeholders to determine potential impacts and conflicts and to agree appropriate mitigation measures.

- Creation of a conceptual model of the site to identify any existing or future potential source-pathway-receptor linkages and evaluation of their significance;

- Production of a report describing the conclusions of this stage of the work, including a description of the historic and current uses along and adjacent to the route, and the geological, hydrological and hydrogeological condition of the site, recommendations for intrusive site surveys/risk assessments that may be required to further enhance the understanding of underlying soils, the groundwater regime, soils gases, ground and surface water quality, or to target potential contaminated areas highlighted by the desk study and the proposed approach to the impact assessment phase.

The scope of any site investigations or risk assessments should be discussed and agreed with SEPA and the local Environment Health Officer (EHO) at Aberdeenshire Council.

PEAT DEPTH SURVEY

At the time of the site visit, it is considered appropriate to complete a peat depth survey in areas along the route corridor where peat is suspected to be present based on geological/soil maps.

The survey will be specific to the location of the proposed infrastructure and will be completed to determine peat depths within the route corridor.

Probing locations will be predefined and uploaded onto a handheld GPS to ensure accuracy and a peat probe with a maximum length of 6m will be used to ascertain peat depth. If additional probing locations are required as a result of encountering deep peat on site; the locations will be recorded using a handheld GPS.

Following the site visit peat depths will be considered within the impact assessment. Recommendations will be provided for mitigation if required.

HYDROLOGY STUDIES

An extensive desk study will be undertaken to establish the baseline hydrological conditions along the cable route, at the substation and landfall point. The aim of this study is to identify:

- The location of all watercourses which requires crossing using OS VectorMap District vector mapping data

- Overland flow paths along the cable route and construction locations using NextMap digital terrain model data
- Flood risk from rivers and coastal waters using SEPA's Indicative River & Coastal Flood Maps
- Location and nature of water abstractions including public and private water supplies from SEPA and Aberdeenshire Council data
- Existing water quality and sensitivity of rivers using SEPA's Water Framework Directive classifications
- Groundwater vulnerability using SEPA's Digital Groundwater Vulnerability Map, Digital Aquifer Map of Scotland and Groundwater Body Information Sheet
- Location of nature conservation areas and reason for designation using SNH datasets

As part of the research, consultation will be made with SEPA, Aberdeenshire Council and Scottish Water to identify any specific requirements and collect any other available data.

5.1.6.8 POTENTIAL MITIGATION METHODS

Potential mitigation measures for onshore environmental impacts include:

- Route selection to avoid features and sensitive receptors (e.g. geologically designated sites).
- Adoption of location specific installation techniques.
- Buffer zones around water courses and other sensitive hydrological features.
- Effective management and control of each phase of the development to mitigate impacts (e.g. by following pollutions prevention guidance notes, site waste management plans, use of personal protective equipment to mitigate health effects on construction workers).
- Environmental monitoring during construction.
- Choice of construction materials/design to accommodate risks from contamination.

Additionally, the development of the construction management plan should take account of potential impacts as a result of ground disturbance; for example, avoidance of sensitive geological receptors.

The mitigation measures proposed for the final OFTO infrastructure will be dependent upon the final route and design and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities as necessary.

5.1.7 AIRBORNE NOISE AND VIBRATION

The construction during installation of the onshore transmission infrastructure (buried cable and onshore substation) will introduce additional noise and vibration into the environment. It is likely that the most significant effects associated with the project will be the noise and vibration as a result of the operation of mobile and static plant machinery vehicles at the landfall of the cable, at construction compounds associated with the project, and at the temporary construction works along the proposed route of the cable. There are no noise and vibration issues associated with the operation of the cable, apart from perhaps infrequent maintenance operations. There is likely to be noise and vibration associated with the construction and operation of the proposed converter substation, and in particular the likelihood of audible transformer hum typically at a frequency of 100 Hz.

5.1.7.1 BASELINE ENVIRONMENT

PRE-EXISTING NOISE CLIMATE

The pre-existing noise climate has a bearing on the significance of any additional noise introduced by the construction. There are no detailed measurements of background noise currently available along the route of the proposed cable routes. Consequently, a review of ordnance survey maps has being undertaken in order to identify possible areas of noise sensitivity.

NOISE ENVIRONMENT FOR PROPOSED CABLE ROUTES

Two routes are being considered, comprising the Rattray to Peterhead cable route corridor, and the Fraserburgh to Peterhead cable route corridor.

The Fraserburgh to Peterhead cable route corridor is the longer (onshore) of the two options, and extends further inland than the Rattray to Peterhead cable route corridor. The noise levels in this proposed corridor are likely to be dominated by the traffic along the minor and major roads. Further away from these roads, and predominantly to the east of the cable route footprint, the ambient noise levels are accepted to be relatively low and typical of rural areas.

The Rattray to Peterhead cable route corridor makes landfall near Rattray Head, in an area of duneland. The route skirts the adjacent gas terminal, before following a roughly southerly course adjacent to the A952(T). The route skirts the village of St Fergus and the St Fergus School, and scattered residential properties especially in the locality of Peterhead.

The proposed onshore substation location is currently unknown, but various locations within 2 km of the substation at Peterhead have been identified and are at an early stage of assessment (see section 2.2.1).

5.1.7.2 DATA GAPS

There are no detailed measurements of background noise currently available along the proposed cable route or substation site. A baseline noise survey will be carried out along the cable route and at the substation site.

5.1.7.3 ENVIRONMENTAL IMPACTS SCOPING

Based on the available literature, it is considered that the potential impacts on sensitive receptors as a result of constructing and operating the onshore OFTO infrastructure may include:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Increase in noise levels as a result of construction work along the cable route and substation site	✓	✓
Increase in noise and vibration from traffic along local roads as a result of construction works	✓	✓
Increase in noise levels as a result of operation (substation) and maintenance works (substation and export cable)	✓	✓

5.1.7.4 IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below.

Potential Impact	**Increase in noise levels as a result of construction work along the cable route and substation site** **Increase in noise levels as a result of operation (substation) and maintenance works (substation and export cable)**
Survey/Study Proposed to Assess Impact	- Baseline noise survey to record the noise at the selected representative stations, to be agreed between MORL and the local authority. It is likely that the survey will comprise both measurements at a limited number of locations adjacent to the cable route, and also a more detailed survey adjacent to the converter substation.
Method of Impact Assessment	A desk-based assessment using the results of the baseline noise survey and modelling, where required, will be used to assess the potential effects of noise and vibration on human receptors for the cable landfall, the cable route, the construction/ operation of the converter substation, maintenance works, and in respect of increased traffic where relevant.

5.1.7.5 SITE-SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The assessment of noise and vibration will be undertaken with reference to published guidance including:

- BS7445 “Description and measurement of environmental noise”
- BS 4142:1997 “ Method for rating industrial noise affecting mixed residential and industrial areas (1997)"
- BS 4142:1997 “Method of rating industrial noise affecting mixed residential and industrial areas"
- BS5228 “Control of noise from open construction sites"
- BS 8233 “Sound insulation and noise reduction for buildings
- Planning policy guidance note PPG 24: Planning and noise.

Prior to work being undertaken consultation will be made with the Aberdeenshire Council Health and Environmental Service to agree the scope and methodology and assessment, and locations at which detailed noise surveys will be undertaken.

A baseline noise survey will be undertaken to record the noise at the selected representative stations, to be agreed between MORL and the local authority. It is likely that the survey will comprise both measurements at a limited number of locations adjacent to the cable route, and also a more detailed survey adjacent to the converter substation.

The survey will comprise measurements of both day and night time noise levels, and will be carried out in accordance with current best practice.

A desk-based assessment will be used to assess the potential effects of noise and vibration on human receptors for the cable landfall, the cable route, the construction of the converter substation, and in respect of increased traffic where relevant.

CABLE ROUTE AND LANDFALL

The desk-based assessment will identify the significance of noise and vibration along the landfall and cable route. Where sensitive areas are identified in the study, these will become the focus of a baseline noise survey.

CONVERTER SUBSTATION SITE

The desk study will be undertaken to provide a first-cut evaluation of the likely impact of noise and vibration from the construction and operation at the converter substation site. If required as a result of this study, the existing noise conditions at the site will be documented by means of an acoustic survey which will measure the noise level in the vicinity of the converter substation location and at representative receptor locations close to the site. The survey will incorporate long-term measures of both day and night time noise levels, and will be carried out in accordance with current best practice guidance. The methodology and monitoring points will be agreed with the appropriate authorities prior to the work being taken. This will form the basis for further assessment if required.

If required, following the preceding survey, modelling will be undertaken to evaluate the expected noise generated by the construction and operation of the onshore substation at representative locations close to the chosen site. The study will consider the potential impact of noise and vibration on human receptors. The modelling will focus on the effects of noise and vibration on local properties, and is anticipated to include consideration of the effects of broadband noise associated with cooling fans and other equipment, broadband noise associated with the operation of the transformers, and low frequency tonal noise and hum. The assessment will use the World Health Organisation guidelines for community noise, the guidance contained in BS4142:1997, and where required published peer reviewed research.

The assessment will follow standard methods to describe qualitatively any impact magnitude and significance, and will be supported by quantitative assessments as required to establish conformity with noise limits.

5.1.7.6 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

The methodologies and potential survey requirements by which cumulative and in-combination effects will be assessed will be agreed with relevant consultees.

5.1.7.7 POTENTIAL MITIGATION METHODS

Potential mitigation associated with the construction works along cable route and substation, may best be achieved through the use of suitable best practice and the agreement of working times to minimise the impact on local communities and critical locations. This may involve controls on the construction activities, including restrictions on hours of work and the use of quiet machinery and construction techniques. In all cases noise disturbance will be minimised using the concept of best available technique.

Potential mitigation with regards to construction/operation noise from the substation may involve the use of noise inclosures; using guidance from BS 8233 “Sound insulation and noise reduction for buildings”.

5.2 BIOLOGICAL ENVIRONMENT

The biological environment receptors are categorised as follows:

- Benthic Ecology
- Fish and Shellfish Ecology
- Marine Mammals
- Intertidal Ecology
- Terrestrial Ecology
- Ornithology (Offshore)

5.2.1 DATA SOURCES

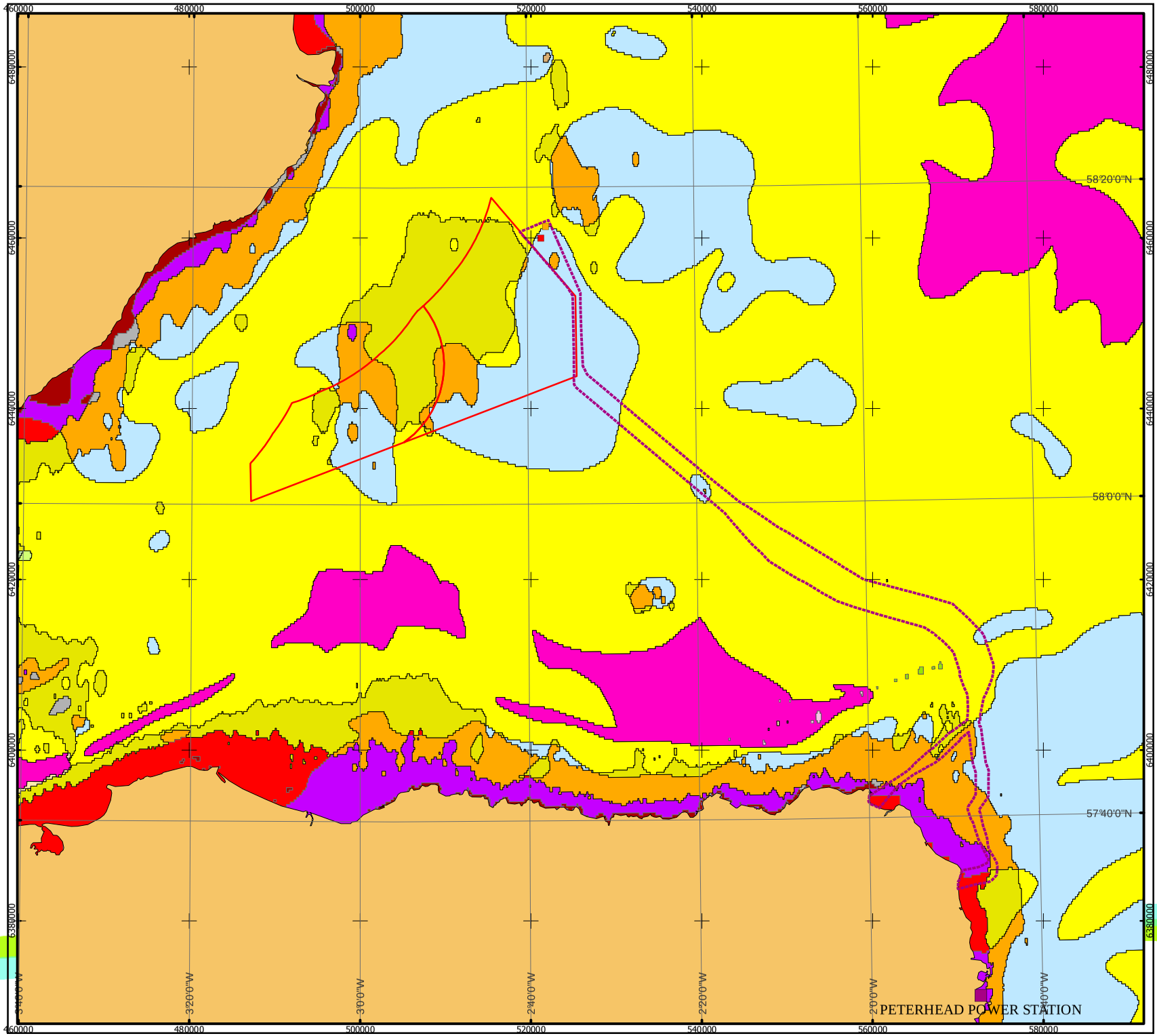
The following data sources provide information on the existing biological environment at the current time:

General:
- Marine Scotland (formerly known as Fisheries Research Services)
- UK Offshore Energy Strategic Environmental Assessment, DECC
- SEA 5: Strategic Environmental Assessment of parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland, DTI
- Strategic Environmental Assessment (SEA) of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Volume 1 Environmental Report (Scottish Government)
- Beatrice Demonstrator Project Environmental Statement
- Scottish Natural Heritage (SNH)
- Joint Nature Conservation Council (JNCC)

5.2.2 BENTHIC ECOLOGY

5.2.2.1 BASELINE ENVIRONMENT

Benthic studies within the Moray Firth have largely focused on the Smith Bank and the Beatrice Field (Eleftheriou *et al*, 2004). The greater part of the Moray Firth and that area relevant to the cable route remains almost entirely unstudied in this context. Broad scale mapping of predictive EUNIS seabed habitats (Figure 5-8) indicates that the current scoping area coincides with circalittoral sand with some circalittoral and circalittoral / infralittoral coarse sediment particularly in inshore areas.



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KEY

EUNIS 2007-11 Predicted Habitats

- Circalittoral coarse sediment
- Circalittoral fine sand or circalittoral muddy sand
- Circalittoral mixed sediments
- Circalittoral sandy mud or circalittoral fine mud
- Deep circalittoral coarse sediment
- Deep circalittoral mixed sediments
- Deep circalittoral mud
- Deep circalittoral sand
- Deep-sea mud
- Deep-sea sand or deep-sea muddy sand
- Faunal communities on deep low energy circalittoral rock
- Infralittoral coarse sediment
- Infralittoral fine sand or infralittoral muddy sand
- Infralittoral mixed sediments
- Low energy circalittoral rock
- Low energy infralittoral rock

SOURCE: From the detaoled Celtic & North Seas data layer from the JNCC EUSeaMap WebGIS

Horizontal Scale: 1:600.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-022

Fig:5-8 Predictive EUNIS Seabed Habitats

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Survey data from SEA 5 for the outer Moray Firth (DTI, 2004) indicated that sediments were variable, ranging from generally coarse sediment cover to muddy, very fine to fine sands becoming finer with depth. This distribution pattern was broadly confirmed following recent site specific EIA investigative surveys within the R3 and Beatrice proposed turbine arrays. These surveys showed that the circalittoral fine sand sediments were characterised by a typical sand fauna including the polychaetes *Spiophanes bombyx, Ophelia borealis, Poecilochaetus serpens* and *Owenia fusiformis*, the bivalve molluscs *Cochlodesma praetenue* and *Crenella decussata* and the urchin *Echinocyamus pusillus*. Coarser sand sediments were characterised by a comparatively richer and more diverse fauna typified by the polychaetes *Chone* sp., *Notomastus* sp., *Lumbrineris gracilis, Aonides paucibranchiata* and *Glycera lapidum*, the pea urchin *E. pusillus*, the amphipod *Atylus vedlomensis* and ribbon worms Nemertea. Very coarse gravel substrates were also found as isolated patches but were generally not amenable to grab sampling techniques. These habitat types were characterised by seabed video which showed an associated epifauna comprising the urchin *Echinus esculentus*, encrusting worms *Pomatoceros* sp. and *Hydroides* sp. the squat lobster *Munida rugosa* common starfish *Asterias rubens* and sparse bryozoan and hydroid turfs.

In the nearshore environment, the habitats are predominately infralittoral coarse sediments (coarse sand, gravelly sand, shingle and gravel) and circalittoral coarse sediments (coarse sands and gravel or shell). Both habitat types are usually characterised by robust bivalve and polychaete species. The horse mussel (*Modiolus modiolus)* is associated with circalittoral coarse sediment (JNCC, 2011) and is common throughout the inner Moray Firth (UK BAP, 2010). However, there are no known areas of *Modiolus* reef (an Annex I habitat) in the vicinity of the offshore cable route study area. The fan mussel *Atrina fragilis* is also known to occur in the Moray Firth (UK BAP, 2010). The fan mussel is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and is listed on the UK Biodiversity Action Plan. There are currently no records of the fan mussel within the vicinity of the proposed offshore cable route study area.

With regard to characterising epibenthos, Calloway *et al*. 2002 identified a northern North Sea assemblage which occurred between 50-100 m (within which the current scoping area was found). The characterising species were whelks such as *Neptunea antiqua* and *Colus gracilis*, the hermit crabs *Pagurus pubescens* and *Anapagurus laevis* as well as other species such as *Hydroides norvegica*, *Hyas coarctatus*, *Flustra foliacea* and *Epizoanthus papillosus*. Jennings *et al.* (1999) identified some similar species as well as *Asterias rubens*, *Crangon allmani* and *Astropecten irregularis*. Attached species accounting for similarity within the northern North Sea cluster were the hydroids *Flustra foliacea*, *Hydrallmania falcata*, *Lafoea dumosa*, the sponge *Suberites ficus*, the sea-squirt *Ciona intestinalis* and the bryozoan *Alcyonidium diaphanum* (Jennings *et al.* 1999).

Subtidal Priority Marine Features (PMFs)

There are three species on the current Scottish draft PMF list which have potential to occur within the current scoped area. These include the European spiny lobster *Palinurus elephas*, the Ocean quahog *Arctica islandica* (both species PMFs) and the mud burrowing amphipod *Maera loveni* (Figure 5-9).

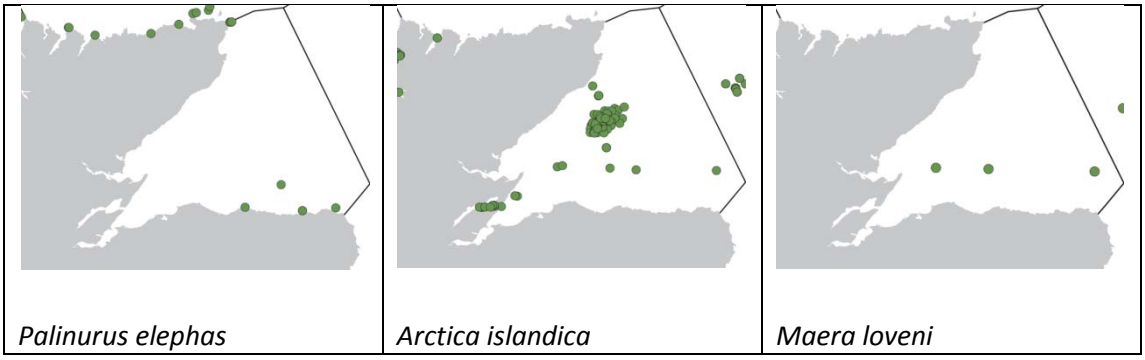


Figure 5-9: Distribution maps of PMF species taken from Scotland's Marine Atlas (2011).

The biotope "sea-pen and burrowing megafauna" is a component of the draft PMF list 'burrowed mud' habitat. Based upon the distribution of seapens (Greathead *et al.*, 2007) and OSPAR map data (Figure 5-10), this habitat type is expected within the current scoping study area.

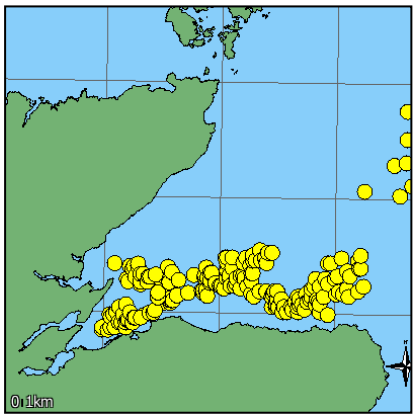


Figure 5-10: OSPAR 'Seapen and burrowing megafauna' habitat as mapped by the NBN Gateway in the Moray Firth Sea Area

The Southern Trench reaches at least 250 m in depth and is more than 120 km in length (Holmes *et al.*, 2004). It has been associated with the draft PMF list cold water coral reef formed by the species *Lophelia pertusa* (Hall-Spencer and Stehfest, 2009). The avoidance of the trench under current routing scenarios suggests that the export cable will not interact with cold water *Lophelia* reef.

5.2.2.2 DATA GAPS

Site specific surveys will be required to determine the potential for Annex I habitats and PMF features.

5.2.2.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on benthic ecology as a result of the proposed OFTO infrastructure:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Temporary increases in suspended sediment concentrations from trenching, augering, seabed preparation (plume effects) and temporary increases in sediment deposition from plumes	✓	✓
Release of contaminants bound in sediments	✓	✓
Loss of seabed habitat through presence of platform substructures and foundations, and (albeit temporary) loss due to export cabling	✓	✓

5.2.2.4 IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below. The potential effects listed have been developed from (a) relevant guidance notes and (b) ESs published for other Round 1 and Round 2 offshore wind farms.

Potential Impact	**Temporary increases in suspended sediment concentrations from trenching, augering, seabed preparation (plume effects) and resultant temporary increases in sediment deposition from plumes.**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Filter/suspension feeding species - Annex I & II and PMF features To determine potential ecological effects of increases in suspended sediment loads and deposition on benthic communities the following studies and surveys are proposed: Drop Down Video
Method of Impact Assessment	The benthic environment will be described using standard marine ecological survey techniques (i.e. bathymetry and sidescan sonar with ground truthing using, drop down video; Davies *et al*., 2001; Ware & Kenny, 2011; CEFAS *et al.,* 2004; Judd, 2011). Locations, along the route of the export cable and within predicted secondary impact areas (i.e. within the likely influence of deposition of disturbed sediments), will be selected on the basis of Admiralty Chart and MESH data in the first instance with additional in-fill video survey based on bathymetric and sidescan sonar survey data, where appropriate. The aim of the video survey will be to characterise the epibenthic ecology of the area and determine the epibenthic biotopes present, their extent and relative conservation importance. An assessment of impacts of sediment resuspension and deposition upon the epibenthos will be carried out within the EIA based on a review of the scientific literature and results of monitoring data from other Round 1 and 2 offshore wind farms (OWF). Impact significance will be determined using standard EIA methodologies. Annex I reefs will be identified using methodologies compiled by

	JNCC (Gubbay, 2007; Irving, 2009; Limpenny, 2010).

Potential Impact	**Release of contaminants bound in sediments**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Filter/suspension feeding species - Annex I & II and PMF features - Trophic web To determine potential contaminants bound in the sediments the following studies and surveys are proposed: Desk top study of historical contaminants within the surrounding seabed. If historical contamination is identified then it may be necessary, following discussions with statutory authorities to undertake: Chemical analysis of sediments
Method of Impact Assessment	The data obtained during the desk study (and benthic survey) will be used to assess the likelihood of sediment contamination using standard EIA methodologies and comparison against Canadian Interim Sediment Quality Guidelines and CEFAS Action Levels In Dredged Materials.

Potential Impact	**Loss of seabed habitat through presence of platform substructures and foundations, and (albeit temporary) loss due to export cabling**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional benthic community To determine potential loss of (and temporary disturbance to) seabed habitat the following studies and surveys are proposed: Drop Down Video
Method of Impact Assessment	Potential impacts through direct habitat loss will be assessed via quantifying any losses in terms of % loss of certain biotopes/habitats, previous experience gained during the assessment of Round 1 and Round 2 OWF and standard EIA methodologies.

5.2.2.5 SITE-SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The following references provide best practice guidance for use in assessing impact upon benthic ecology:

- Davies *et al*. (2001). Marine Monitoring Handbook
- Ware, S.J. & Kenny, A.J. (2011). Guidelines for the conduct of benthic studies at marine aggregate extraction sites. 2nd edition. Marine Aggregate Sustainability Fund 80pp.
- NMMP (2003). National Marine Monitoring Programme Green Book. V7.
- CEFAS (2004). Offshore Wind Farms: guidance notes for Environmental Impact Assessment in respect of FEPA and CPA requirements. Version 2
- DEFRA (2005) Nature conservation guidance on offshore wind farm development
- Hendrick *et al.* (2006). *Sabellaria spinulosa* reef: a scoring system for evaluating 'reefiness' in the context of the Habitats Directive

- Gubbay (2007). Defining and Managing *Sabellaria spinulosa* Reefs: Report of an Inter-agency Workshop
- OSPAR (2008). OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development
- IEEM (2009). Guidelines for Ecological Impact Assessment in Britain and Ireland - Marine and Coastal Consultation document
- Irving (2009). Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive. Summary of an Inter-agency Workshop 26-27, March 2008
- Limpenny et al. (2010). Best methods for identifying and evaluating *Sabellaria spinulosa* and cobble reef. Aggregate Levy

SURVEY DESIGN

Benthic surveys have already been completed for the eastern development area of the zone and this will be used to assess the potential impact of the offshore substations.

The following provides an indicative scope to undertake a benthic ecology characterisation utilising Drop Down Video (DDV) to characterise the export cable route study area so that potential impacts may be identified and assessed and also to inform a subsequent preconstruction (baseline) survey. The proposed survey and a brief methodology is outlined in the following sections. The final survey design will be based upon MESH and Admiralty Chart data with additional in-fill survey based on the findings of the geophysical survey, if required, and will be agreed with Marine Scotland, JNCC and SNH.

DROP DOWN VIDEO SURVEY

On the advice of SNH and JNCC (consultation meeting, 28 February 2011), a drop down video survey will be undertaken of the export cable route study area. The deployment of a DDV would allow the identification of epibenthic species and biotopes. The deployment of the DDV will also allow for the identification of any potential Annex 1 designated under the Habitats Directive features by trained marine biologists in the field, prior to the deployment of a grab.

The video tracks and photographic stills from the DDV survey will be reviewed and analysed using office based facilities and undertaken by experienced marine ecologists. The DDV footage will be used to assign epibenthic biotopes based on the habitat and species present at each station. Species will be identified and enumerated from selected representative video stills (minimum 3 stills images per station) for classification analysis (Bray-Curtis similarity and MDS) and epibenthic community assessment. Substrate composition will be recorded based upon principal sediment characteristic (i.e. rippled fine sand, coarse sand etc.). Epibenthic biotope classification will then be conducted using the JNCC Marine Habitat Classifications for Britain and Ireland (Conner *et al*., 2004) based on those communities present. Classified epibenthic biotopes, will be mapped throughout the export cable corridor with the extents of the boundaries interpolated using available acoustic data drawn from the geophysical surveys.

Relevant data will then be transferred to GIS format so that spatial plotting of information can be achieved. Information gathered from the benthic surveys will be interpreted to provide a biotope map for the area and detailed information on the location and extents of any Annex I habitats and PMF features within the vicinity of the export cable corridor. The report will highlight significant species and habitats within the context of nature conservation. Where appropriate, reference will be made to relevant legislation and the known geographical distribution of the feature.

PARTICLE SIZE DISTRIBUTION (PSD) AND SEDIMENT CHEMISTRY ANALYSES

Where required, sediment samples will be obtained using a 0.1 m^2 stainless steel Day or Hamon grab sampler. Each sediment sample for particle size distribution (psd) analysis will be processed in the laboratory through sieves over the range 64 mm to 63 µm (0.063 mm) on the Wentworth scale in accordance with Ware & Kenny (2011) to determine the particle size composition of the seabed sediments. The sediment is washed through a 63 µm (0.063 mm) sieve and the retained material oven dried at 800^0C before being transferred to the coarsest of a series of stacked sieves.

These are placed on an automatic shaker for 15 minutes and the contents of each sieve subsequently weighed. Material washing through the 63 µm sieve will be collected in pre-weighed beakers, oven dried at 300^0C and weighed as a separate fraction. This fraction can be analysed by laser sizing should this be required for coastal process studies.

For each sampling station the results will be expressed as cumulative percentage of each particle size passing through each sieve size. For the purposes of the report and the statistical analysis to be carried out, these percentages are converted to absolute percentage retained on each sieve size.

These psd data will be used to inform the coastal and sediment processing modelling and where appropriate, will inform biotope classification and fish (sandeel) habitat assessment.

Samples for determination of sediment chemistry will be transferred to a UKAS accredited laboratory for analysis (specific determinants to be agreed with Marine Scotland and SNH/JNCC).

DATA ANALYSIS

Data drawn from the video analyses will be analysed within the PRIMER suite of statistical routines to describe community and seabed sediment distribution in an attempt to elucidate relationships between epifaunal assemblages and physical variables, recognising the limitations of the semi-quantitative nature of video surveillance data. Cluster analysis (Bray Curtis similarity measure) and MDS will be attempted to identify sample groups for matching with the Marine Habitat Classification system.

Biotopes will be defined from a synthesis of the physical and biological video data and mapped throughout the export cable corridor. The extents of the boundaries of each biotope will be interpolated using available acoustic data drawn from the geophysical surveys.

Biotopes will be the principal biological unit for appraisal of the predicted effects of installation and operation of the OFTO infrastructure. Considerable information exists concerning the sensitivity characteristics of biotopes (e.g. MarLIN) making them particularly suitable for EIA. MarLin will therefore be a principal data source underpinning the ecological assessments and reducing the uncertainties associated with such assessments.

5.2.2.6 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

The cumulative and in-combination impact assessment principles outlined in the MFOWDG Cumulative Impacts Assessment Discussion Document (ERM, 2011) are also of relevance to the EIA for the offshore transmission infrastructure for MORL and BOWL. The principle considerations that must be contemplated include physical disruption directly due to the installation and construction of

the cable infrastructure and indirectly through movement of sediment and changes in the hydrodynamic regime. Additional impacts from heat transfer from cabling are understood to cause little or no effect on benthic communities. Accidental spillage from the development infrastructure during construction is a possibility but this will be mitigated within respective construction and operational environmental management plans.

5.2.2.7 POTENTIAL MITIGATION METHODS

Potential mitigation measures for marine benthic impacts include micrositing substations and cables around features and choice of installation techniques.

The mitigation measures proposed for the final OFTO infrastructure will be dependent upon the final design and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.2.3 FISH AND SHELLFISH ECOLOGY

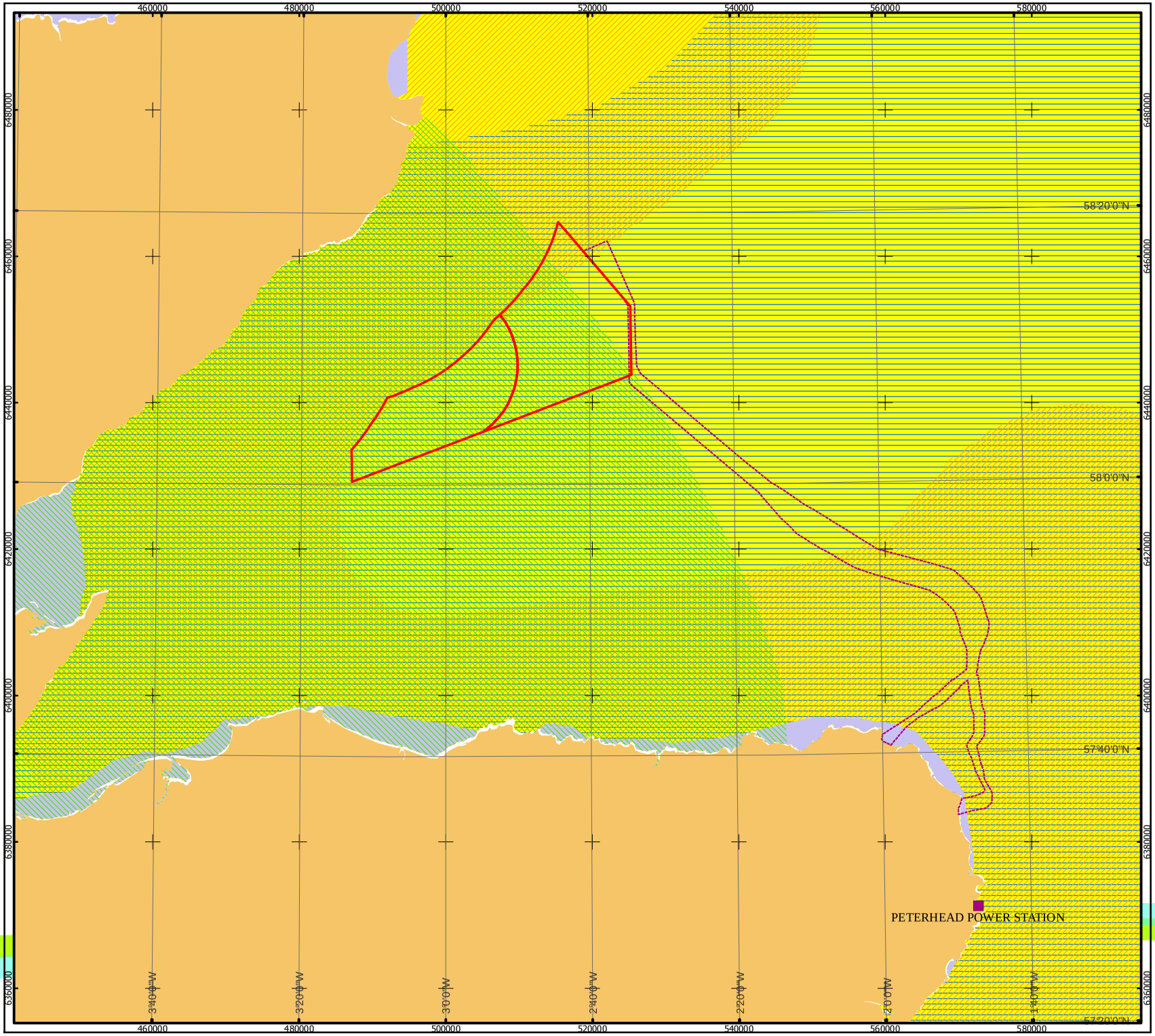
5.2.3.1 BASELINE ENVIRONMENT

SPAWNING AND NURSERY AREAS

There are various spawning and nursery grounds in the vicinity of the proposed offshore transmission infrastructure. These include spawning grounds for herring, cod, plaice, whiting, lemon sole, sprat, sandeels and *Nephrops* and nursery grounds for herring, haddock, whiting, saithe, lemon sole, sprat, sandeels and *Nephrops.* Spawning and nursery grounds are dynamic features of fish life history and are rarely fixed in one location from year to year. In addition, fish may spawn earlier or later in the season in response to environmental change. Therefore, the information provided in Figure 5-11 and Figure 5-12 represents the widest known distribution of spawning and nursery grounds.

Most commercially important UK fish species are pelagic spawners, i.e. they release their eggs within the water column. An exception to this is herring, which lays eggs on the seabed, in specific gravelly substrate types. Herring are known to spawn in the Moray Firth, particularly in coastal areas off Caithness and Peterhead, There is potential therefore for some sections of the proposed export cable route to go through herring spawning grounds. The available information indicates that spawning occurs in the Moray area between August and September.

Sand eel also lay eggs on the seabed, throughout the Moray Firth region. The available information indicates that sandeel spawn in this area between November and February. Sand eel spend most of the year buried in the seabed, only emerging into the water column to spawn and during an extended feeding period in spring and summer being highly dependent on the presence of an adequate substrate in which to burrow.



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KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- Herring Nursery Grounds
- Plaice Nursery Grounds
- Sandeel Nursery Grounds
- Nephrops Nursery Grounds
- Sprat Nursery Grounds

SOURCE: Fisheries Sensitivities Maps in British Waters (Coull et al.,1998), CEFAS

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-028

Fig:5-11 Nursery Grounds within the Moray Firth

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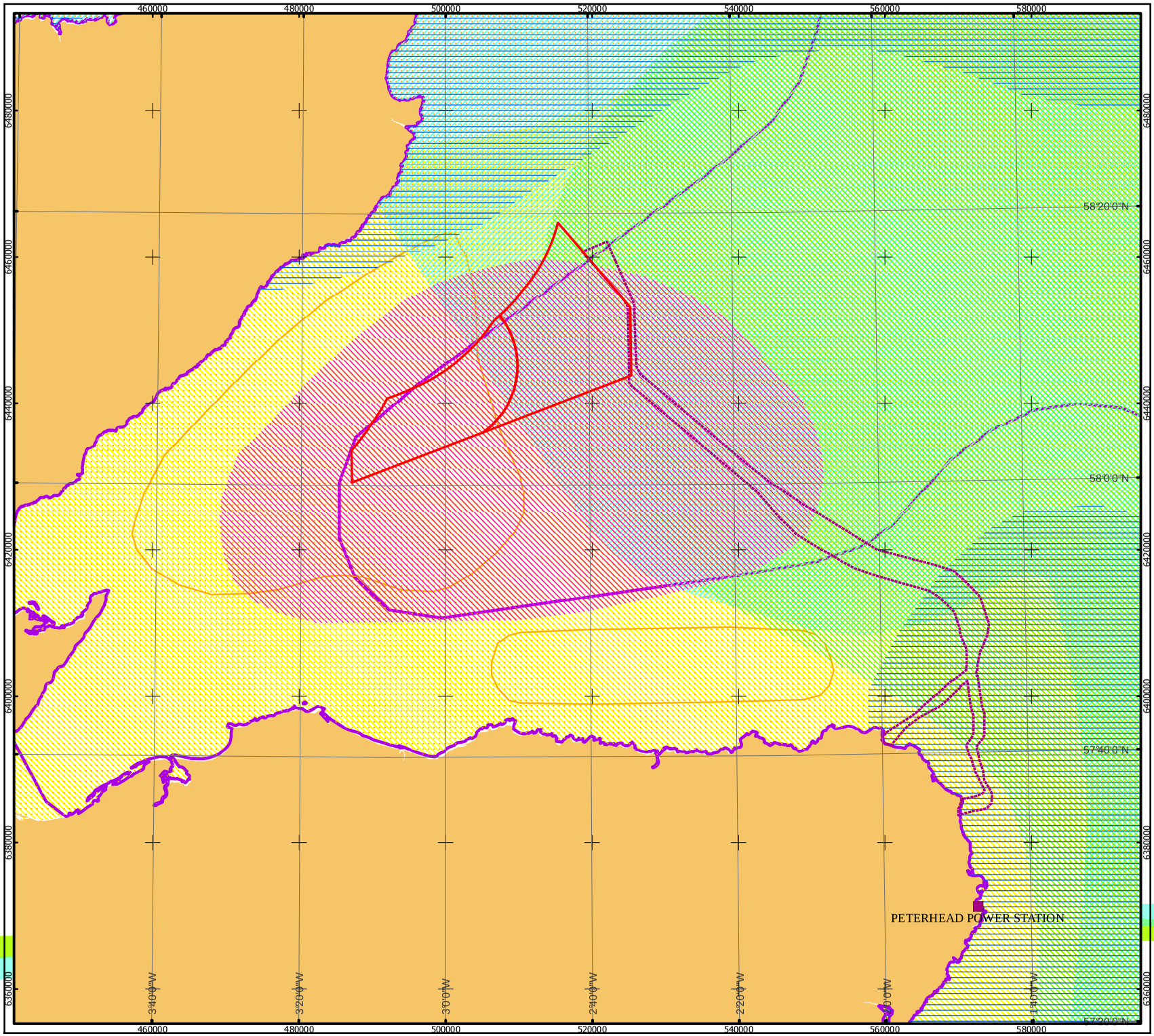

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REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area

Spawning Grounds

Species

- Herring
- Cod
- Whiting
- Lemon Sole
- Sprat
- Plaice
- Sandeel
- Nephrops

SOURCE: Fisheries Sensitivities Maps in British Waters (Coull et al.,1998), CEFAS

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 846001-PSO0010-MOR-MAP-027

Fig: 5-12 Spawning Areas within the Moray Firth

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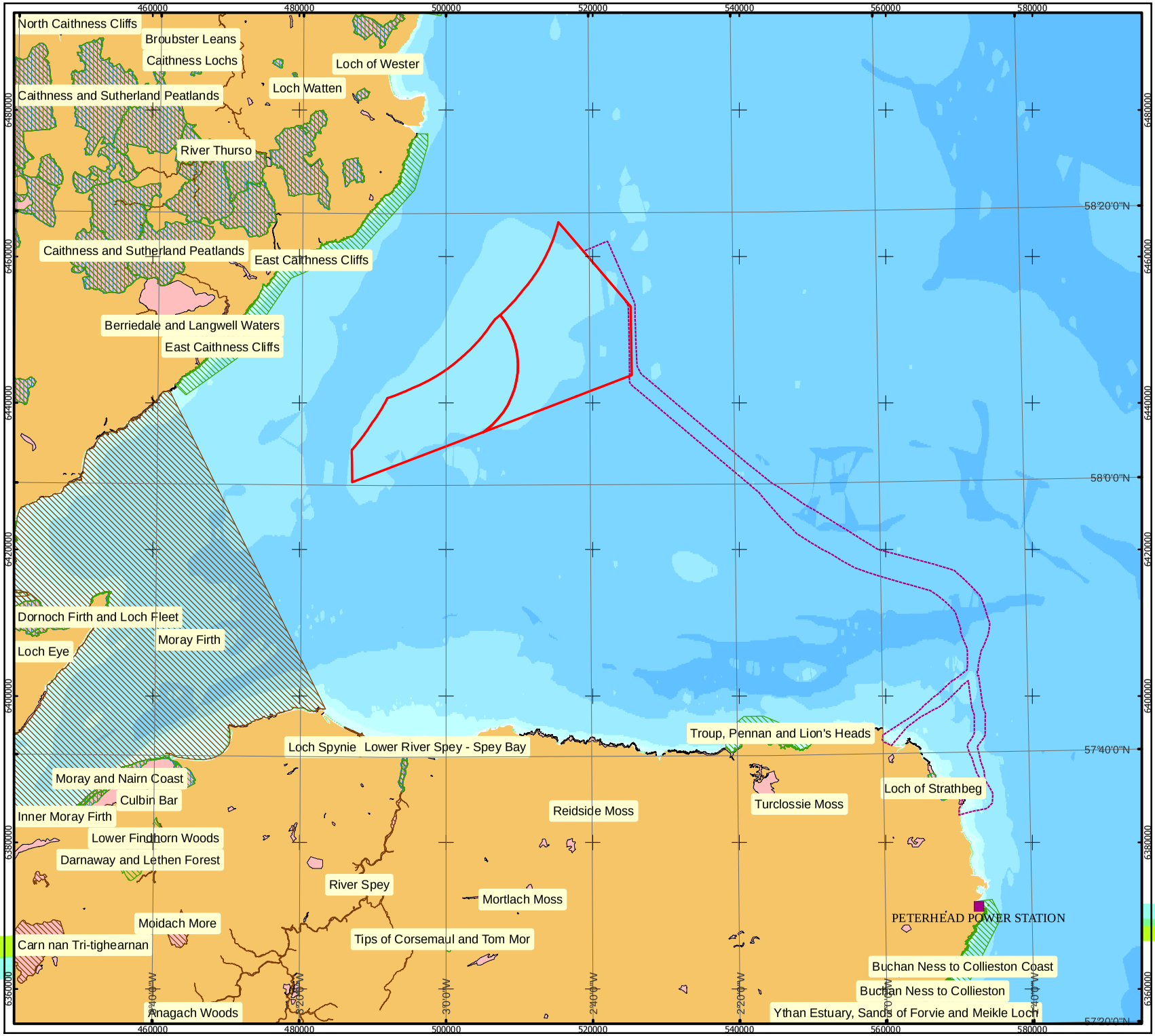
DIADROMOUS SPECIES

Within the Moray Firth there are several species that migrate between fresh and salt waters. These are the Atlantic salmon *(Salmo salar*), sea trout (*Salmo trutta*), sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), eel (*Anguilla anguilla*), twaite shad (*Alosa fallax*) and allis shad (*Allosa alosa*) (Barnes *et al*., 1996; DTI, 2004). Atlantic salmon, river and sea lamprey, twaite shad and allis shad are listed as protected species in Annex II of the EU Habitats Directive. Sea trout are also a UKBAP species. These species are anadromous, spawning in freshwaters and completing their life cycle in the marine environments. An exception to this is European eels which are catadromous. They spawn in the Sargasso Sea and enter the freshwater habitat as juveniles (glass eels). Several sites with the Moray Firth area have been designated Special Areas of Conservation (SACs) for the presence of one or more of the Annex II species, as described in Table 5-1 and shown in Figure 5-13 (JNCC, 2010).

Table 5-1: SACs designated for natural fish or freshwater pearl mussel*interest the Moray Firth area.

Site	**Minimum Distance From the River Mouth to MORL's Proposed Offshore Route Corridors**	**Relevant SAC Qualifying Feature**
Berridale and Langwell Waters SAC	50 km (direct distance)	**Annex I Habitats:** none **Annex II species (primary feature):** Atlantic salmon (*Salmo salar*).
River Spey SAC	59 km (direct distance)	**Annex I Habitats:** none **Annex II species (primary features):** Freshwater pearl mussel (*Margaritifera margaritifera*), sea lamprey (*Petromyzon marinus*), Atlantic salmon (*Salmo salar*), otter (*Lutra lutra*)
River Thurso SAC	80 km (approximate)	**Annex I Habitats:** none **Annex II species (primary features):** Atlantic salmon (*Salmo salar*).
River Evelix SAC	95 km (approximate)	**Annex I Habitats:** none **Annex II species (primary feature):** Freshwater pearl mussel (*Margaritifera margaritifera*).
River Oykel SAC	110 km (approximate)	**Annex I Habitats:** none **Annex II species (primary feature):** Freshwater pearl mussel (*Margaritifera margaritifera*). **(secondary feature)**: Atlantic salmon (*Salmo salar*).
River Moriston SAC	160 km (approximate)	**Annex I Habitats:** none **Annex II species (primary features):** Freshwater pearl mussel (*Margaritifera margaritifera*). **(secondary feature)**: Atlantic salmon (*Salmo salar*).

* The species is dependent on the presence of salmonid fish as the larvae lodges on their gills.



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REPSOL

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KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- SPAs SCOTLAND
- SACs SCOTLAND
- RAMSAR SITES SCOTLAND
- SSSIs SCOTLAND

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-023

Fig: 5-13 Designated Sites (of Marine Interest)

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Salmon and sea trout are also recognised under the UK Salmon and Freshwater Fisheries Act (1975). In addition, salmon and sea trout support fisheries of importance from a socioeconomic point of view in the region. Allis and twaite shad are also protected under Schedule 5 of the Wildlife and Countryside Act 1981.

ELECTROMAGNETIC SENSITIVE SPECIES AND ELECTROMAGNETIC FIELDS

A number of reports have been produced in recent years that investigate issues surrounding the potential for sub-sea power cables required for offshore wind farms to create electromagnetic fields (EMF) (Gill, A.B. & Bartlett, M., 2010). Specific concerns have been expressed that should such fields result, there is the potential for an effect on electro and magnetosensitive species, mainly migratory fish (e.g. European eel, salmon, etc) and elasmobranchs (sharks and rays).

COMMERCIAL SPECIES

The principal commercial fish and shellfish species in the area relevant to the export cables are discussed in section 5.3.2. It should be noted, that the distribution range of some of these, (e.g. *Nephrops* and scallops) is also dependent on the presence of a suitable substrate. Commercial species have a grouped action plan and some individual commercial species (e.g. cod and mackerel) have individual species action plans under the UKBAP.

5.2.3.2 DATA GAPS

There are gaps in the current knowledge of the distribution, behaviour and ecology of certain species. This is particularly evident for a number of migratory species (e.g. salmon, European eel) for which little is known in relation to exact migration routes and the use that they may make of coastal areas such as the Moray Firth.

5.2.3.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on fish and shellfish as a result of proposed OFTO infrastructure:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Habitat loss and displacement	✓	✓
Disturbance to nursery/spawning grounds as a result of construction and increases in sediment deposition	✓	✓
Effects associated with construction and operational noise of the substation platforms	✓	✓
Effects of electromagnetic fields associated with cabling	✓	✓
Effects of increased sediment concentrations	✓	✓

5.2.3.4 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below.

Potential Impact	**Habitat loss and displacement**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional fish and shellfish community To determine the potential for habitat loss and displacement, the following surveys and studies will be undertaken: Fish and shellfish desk based study Review of commercial fisheries study (e.g. fishing grounds) Review of benthic study and particle size analysis
Method of Impact Assessment	The spatial and temporal use that fish and shellfish species make of the study area will be described and the potential for habitat loss through substation placement and temporary habitat loss and disturbance as a result of cabling installation related operations will be assessed.

Potential Impact	**Disturbance to nursery/spawning grounds as a result of construction and sediment deposition**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Species with spawning/nursery grounds within the Moray Firth To determine the potential for disturbance to nursery and spawning grounds the following surveys and studies will be undertaken: Fish and shellfish desk based study Review of coastal processes study
Method of Impact Assessment	Potential impacts on spawning habitats through increased sediment loads will be assessed using the outputs of the coastal process assessment and published data on the sensitivity of fish species found to be spawning in this area to high sediment loads (including Round 1 and 2 OWF data).

Potential Impact	**Effects associated with construction and operational noise of the substation platforms**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional fish and shellfish community - Species with spawning/nursery grounds within the Moray Firth To determine levels of disturbance associated with noise the following studies and surveys will be undertaken: Fish and shellfish desk based study
Method of Impact Assessment	Potential noise impacts during the construction phase on fish and shellfish species will be assessed via a review of the relatively large body of data that exists on this topic, including developer-led work and COWRIE projects (Bio/Consult AS, 2001; Wahlberg and Westerberg, 2005; Nedwell *et al.*, 2007). Use of assessment tools such as audiograms and species-metrics will be adopted.

Potential Impact	Effects of electromagnetic fields associated with cabling
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Electro and magneto- sensitive species To determine the distribution of electro and magneto-sensitive species the following studies and surveys will be undertaken: Fish and shellfish desk based study
Method of Impact Assessment	The findings of recent COWRIE projects (Gill *et al.,* 2005, Gill *et al.*, 2009) and SNH reports (Gill & Barlett, 2010) investigating the effects of EMF on sensitive fish species will be used to determine the significance of any impacts on fish species from EMF associated with the wind farm cables.

Potential Impact	Effects of increased sediment concentrations
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional fish and shellfish community - Species with spawning/nursery grounds To determine potential disturbance from sediment plumes the following studies will be undertaken: Coastal processes study Fish and shellfish desk based study Particle Size Analysis.
Method of Impact Assessment	Potential impacts of increased sediment loads will be assessed using the outputs of the coastal process assessment, published data on the sensitivity of fish species (including Wound 1 and 2 OWF data) found in this area to high sediment loads and standard EIA methodologies.

5.2.3.5 SITE-SPECIFIC SURVEY METHODOLOGY

The following relates to the surveys for the EIA. Marine Scotland, JNCC and SNH will be consulted with regards to the requirements for data collection to support an Appropriate Assessment. It is noted that in some cases, impacts on SACs, where salmon is a designating feature, the potential for impacts on the freshwater pearl mussel will also need to be considered (see section 5.2.6 Terrestrial Ecology).

BEST PRACTICE GUIDANCE

The following references provide best practice guidance for use in assessing impact upon fish and shellfish ecology:

- Davies *et al*. (2001) Marine Monitoring Handbook
- CEFAS (2004) Offshore Wind Farms: guidance notes for Environmental Impact Assessment in respect of FEPA and CPA requirements. Version 2
- DEFRA (2005) Nature conservation guidance on offshore wind farm development
- OSPAR (2008) OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development

5.2.3.6 SUMMARY OF METHODOLOGY

The following summary methodology is provided as a guide only and the final methodology will be determined in discussion with Marine Scotland, JNCC and SNH.

FISH AND SHELLFISH DESK BASED STUDY

The study will be undertaken by marine scientists in order gather data for the area to inform the development of suitable site specific sampling strategies. The desk based study will entail an interrogation of available datasets and literature and consultation with relevant stakeholders. Data will be collated and mapped in GIS to illustrate the spatial and temporal scales of fish and shellfish assemblages, species of commercial importance, nursery and spawning areas and the occurrence of migratory species and species of conservation importance.

5.2.3.7 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

The methodologies outlined within the MFOWDG Cumulative Impacts Assessment Discussion Document (ERM, 2011a) are also of relevance for the offshore transmission infrastructure. The report states that potential impacts could occur through disruption of behavioural pattern, such as migratory or spawning activity, changes to composition due to displacement, loss of habitat and adaptations to prey availability. There is potential for direct disruption through construction as well as the potential effects of EMFs from the cabling.

5.2.3.8 POTENTIAL MITIGATION METHODS

Potential mitigation measures for impacts on fish and shellfish include choice of installation techniques for substation foundations and cables, cabling type (e.g. AC or HVDC) and timing of construction activities.

The mitigation measures proposed for final OFTO infrastructure will be dependent upon the final design and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.2.4 MARINE MAMMALS

5.2.4.1 BASELINE ENVIRONMENT

To date, a total of 14 cetacean species have been recorded alive within the Moray Firth (Table 5-2). Other species have been found stranded within the firth area but are not included in this review due to the uncertainty in the animals' location before death. Two species of pinniped also occur in the Moray Firth.

Table 5-2: Frequency of marine mammal recordings within the Moray Firth area.

Common Name	*Latin name*	Frequency of recordings
Pinnipeds		
Harbour seal	*Phoca vitulina*	Common, all year
Grey seal	*Halichoerus grypus*	Common, seasonal
Cetaceans		
Harbour porpoise	*Phocoena phocoena*	Common, all year
Bottlenose dolphin	*Tursiops truncates*	Common, all year
Common dolphin	*Delphinus delphis*	Common, seasonal
White-beaked dolphin	*Lagenorhynchus albirostris*	Common, seasonal
Minke whale	*Balaenoptera acutorostrata*	Common, seasonal
Risso dolphin	*Grampus griseus*	Occasional
White-sided dolphin	*Lagenorhynchus acutus*	Occasional
Killer whale	*Orcinus orca*	Occasional
Pilot whale	*Globicephala melas*	Rare
Humpbacked whale	*Megaptera novaengliae*	Rare
Fin whale	*Balaenoptera physalus*	Rare
Sperm whale	*Physeter macrocephalus*	Rare
Northern bottlenose whale	*Hyperoodon ampullatus*	Rare
Beluga whale	*Delphinapterus leucas*	Rare

Two Special Areas of Conservation (SACs) have been designated within north-east mainland Scotland, one for the bottlenose dolphin (the Inner Moray Firth SAC) and another harbour seal (Dornoch Firth and Morrich More SAC) (Figure 5-13).

Harbour seals, grey seals, bottlenose dolphins and porpoises are found in the Moray Firth area all year round, with the abundance for these species in inshore areas often being higher during summer months. For cetacean species only occasionally recorded, such as fin whales, humpback whales, northern bottlenose whales, long-finned pilot whales and sperm whales, the area off north-east Scotland is only a marginal part of their habitat and is likely to be inhabited only during a restricted part of the year (Hammond *et al*., 2004).

The most commonly recorded cetacean species within the outer Moray Firth area are: bottlenose dolphin, harbour porpoise, minke whale, white-beaked dolphin and common dolphin (Thompson *et al*., 2009). Of these, harbour porpoise are the most commonly sighted species throughout the outer Moray Firth region. Bottlenose dolphin sightings are relatively rare in the outer Moray Firth, with the majority in the inner Moray Firth and along the southern coast, generally in waters of less than 25 m depth (Hastie *et al.*, 2003; Canning, 2007; Robinson *et al*., 2007).

A number of haul out sites for harbour seals can be found within the Moray Firth, primarily in the Beauly, Cromarty and Dornoch Firths and Loch Fleet (Thompson *et al*., 1996; SCOS, 2009). Harbour seals occur throughout the year in these areas, with peak numbers at haul out sites between June and August (Thompson & Miller, 1990; Thompson *et al*., 1996). Tagging studies within the Firth found that in summer harbour seals tend to forage quite close to their haul out sites, generally travelling no more than 60 km. They tend to forage slightly further afield in the winter and seasonal differences were found in the areas used (Thompson *et al*., 1996).

Within the Moray Firth, grey seals are predominantly observed during the summer although a few can be found throughout the year. Non-breeding grey seals have been observed at the intertidal sites within the firths used by harbour seals. Breeding grey seals are mostly found at the rocky beaches and caves to the north (Thompson *et al*., 1996). Data obtained from tagged individuals published by SMRU (McConnell *et al*., 1999) has found that grey seal foraging trips fall into two categories: long distance trips up to 21,000 km, and short, regular trips to local feeding areas. Tagging studies within the Moray Firth found grey seals foraged over a much wider area than the harbour seal with great variation between individuals.

5.2.4.2 DATA GAPS

There is an extensive amount of marine mammal data for the Moray Firth area including recent survey data collected to support the Round 3 Zone 1 offshore wind farm. Draft baseline reports have recently been submitted to Marine Scotland, JNCC and SNH to inform the consultation process for the offshore wind farm. While the boat-based marine mammal observations and cPOD deployment will be continued across the wind farm area, and habitat association modelling continued throughout the Moray Firth and expanded to include the OFTO cable corridor, no further data are proposed to be collected to inform the marine mammal impact assessment for the OFTO cable route consent application.

5.2.4.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on marine mammals as a result of the proposed OFTO infrastructure:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Disturbance and potential displacement as a result of elevated construction and operational noise (including vessel noise)	✓	✓
Increased collision risk resulting in injury or death due to construction and maintenance impacts (including vessel movements)	✓	✓
Potential reduction of the feeding resource due to effects on prey of noise and vibration, and habitat disturbance	✓	✓

5.2.4.4 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a study and method of impact assessment is described in the tables below.

Potential Impact	**Disturbance and potential displacement as a result of elevated construction and operational noise (including vessel noise)**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional marine mammal community To determine the potential for disturbance and displacement, the following studies will be undertaken: Modelling of marine mammal density and distribution for the cable route study area Literature review of marine mammal species audiograms Desk-top study and noise modelling to determine zones of noise around piling operations (for substations) Literature study of marine mammal behavioural responses to construction of offshore cables and substations.
Method of Impact Assessment	Marine mammal species density and distribution data will be used to model population densities across the cable route study area over time. Background noise measurement data held within the noise consultants' database will be used to model the severity of noise of piling operations over distance. These model outputs will be assessed in relation to audiograms and species density to quantify the potential level of impact on species during construction and maintenance works. The potential for impacts will also be assessed with regard to the time of year so that levels of impact may be assumed with regard to different seasonal patterns of use.

Potential Impact	**Increased collision risk resulting in injury or death due to construction and maintenance impacts (including vessel movements)**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional marine mammal community To determine the potential for disturbance and displacement, the following studies will be undertaken: Modelling of marine mammal density and distribution for the cable route study area Desk study of collision risk associated with cable construction and other vessel traffic.
Method of Impact Assessment	Marine mammal species density and distribution data will be used to model population densities across the site over time. The number of vessels required during construction and maintenance will be estimated over time. These data will be used to estimate collision risk with regard to the time of year so that levels of impact may be assumed with regard to different seasonal patterns of use. Where available, the results of the study will be cross-referenced against information on baseline traffic levels in the Moray Firth.

Potential Impact	Potential reduction of the feeding resource due to effects on prey of noise and vibration, and habitat disturbance
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional marine mammal community To determine the potential for reduction of feeding resource, the following surveys and studies will be undertaken: Modelling of marine mammal density and distribution for the cable route study area Survey of marine benthic habitats (see section 5.2.2.5) Literature review of noise sensitive marine species audiograms (not including marine mammals) Desk-top study and noise modelling to determine zones of noise around piling operations (for substations) Literature study of marine mammal foraging habits and changes to marine trophic web associated with offshore power cables
Method of Impact Assessment	The potential for marine mammal species to be feeding within the site will be determined by assessing the distribution and density data of marine mammals within the site and relating this to literature accounts of species foraging habitats and habitat maps, along with the density and distribution of marine benthic organisms and fish within the cable route study area. The potential impact of construction and operation on habitats, benthic organisms and fish species will be determined using available information. In addition, noise propagation models will be used to model the severity of noise of piling operations over distance. The potential impact of increased noise on prey resources will be assessed where audiograms are available for noise sensitive fish and marine benthic species. These impact assessments will be used to assess the potential impact upon the foraging habits of marine mammals. The potential for impacts will also be assessed with regard to the time of year so that levels of impact may be assumed with regard to different seasonal patterns of use.

5.2.4.5 SITE SPECIFIC METHODOLOGY

The following relates to the surveys for the EIA.

BEST PRACTICE GUIDANCE

At present, there is limited guidance from SNH or the Scottish Government on how to tackle the issue of deliberate disturbance, however the JNCC (2010) has produced guidance which provides an interpretation of what constitutes a 'significant' group and explains the 'disturbance offence' in greater detail. The guidance refers to the Habitats Directive Article 12 Guidance (European Commission, 2007) stating that in their view significant disturbance must have some ecological impact.

LITERATURE STUDY

A desktop literature search will be carried out to collect information on and inform impacts assessments for marine mammals. These literature searches will include:

- Marine mammal species density and abundance within and around the cable route study area
- Audiograms for marine mammals and other noise sensitive species
- Marine mammal behaviours (including foraging)
- Impacts associated with offshore power cables and the success of mitigation measures

5.2.4.6 SURVEY OF MARINE MAMMAL DENSITY AND DISTRIBUTION

Details on survey methods being used to collect data for the zone and the wider Moray Firth are provided in the Eastern Development Area Scoping Report (MORL, 2010). Draft baseline reports have already been submitted to Marine Scotland, JNCC and SNH to inform the consultation process.

For the purposes of assessing the impacts and potential mitigation of oil exploration operations in the Moray Firth, a three year programme of cetacean studies was commenced by the University of Aberdeen with funding from DECC, the Scottish Government, COWRIE and Oil and Gas UK. MORL are providing additional funding to the University of Aberdeen and the St Andrews Sea Mammal Research Unit (SMRU) to extend the examination of these data and undertake additional studies to establish a baseline of marine mammal activity in the region of the offshore wind farms and export cable route. Further details of these studies can also be found in Eastern Development Area Scoping Report (MORL, 2010).

OTHER SURVEYS/ASSESSMENTS TO BE USED TO IDENTIFY IMPACTS

- Underwater noise assessment is described in section 5.1.5.
- Habitat distribution surveys are described in section 5.1.4.3.
- Marine benthic surveys are described in section 5.2.2.5.
- Fish studies are described in section 5.2.3.5.

5.2.4.7 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

The MFOWDG Cumulative Impacts Assessment Discussion Document (ERM, 2011a) outlines the key cumulative impacts that could potentially result from the proposed offshore wind farm developments (MORL and BOWL). The report states that increased operational activity may inflict multiple effects on the marine mammal communities i.e. increased collision risk, decreased abundance of feeding resource due to noise, vibration or disturbance. The mammals may also be potentially directly affected by operational noise during construction. Potential impacts include the concern for underwater noise production during construction. There is a distinct lack of research on the impacts of this consequence, and there is scope in the future for detailed analysis of this subject.

The approach outlined above for the wind farm developments is also of relevance for the offshore transmission infrastructure EIA and therefore a similar assessment methodology will be followed

5.2.4.8 POTENTIAL MITIGATION METHODS

Potential mitigation measures for impacts to marine mammals include choice of installation techniques for substation substructure and foundations and cables, the use of marine mammal observers and passive acoustic monitoring to ensure no marine mammal activity within a site prior to construction activities, the use of soft start procedures for piling activities and timing of construction activities.

The mitigation measures proposed for the final OFTO infrastructure will be dependent upon the final design and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.2.5 INTERTIDAL BENTHIC ECOLOGY

5.2.5.1 BASELINE ENVIRONMENT

Two potential cable landall sites at Rattray Head and Fraserburgh Beach are currently under consideration.

Eleftheriou and Robertson (1988) describe the intertidal areas of Fraserburgh Bay and Rattray Head as being exposed and characterised by mobile sand with low infauna diversity, lack of sedentary forms and numerical dominance of agile swimmers, such as amphipods (e.g. *Pontocrates arenarius*) and isopods (e.g. *Eurydice pulchra*). The latter are characterised by a short life span and are able to withstand sediment disturbance. The sandy beaches are delimited upper-shore by sand dunes (see http://magic.defra.gov.uk/website/magic/). The latter are of considerable extent and variety and some are nationally important (UK BAP).

5.2.5.2 DATA GAPS

Site specific surveys will be required to determine the extent and distribution of intertidal species and habitat receptors including Annex I features.

5.2.5.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on intertidal benthic ecology as a result of the proposed OFTO infrastructure:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Release of contaminants bound in sediments	✓	✓
Temporary sediment disturbance due to export cabling	✓	✓

Since cable installation will be undertaken at low tide, there is not expected to be any significant direct release of suspended sediments into the water column from this activity. Also, whilst tidal inundation of the construction site may liberate some finer sediments, the effect and extent of this is considered to be very small. As such, we consider that the effects of temporary increases in suspended sediments and associated plume effects from installation of OFTO infrastructure on intertidal benthic ecology can be scoped out at this stage.

5.2.5.4 IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below. The potential effects listed have been developed from (a) relevant guidance notes and (b) ESs published for other Round 1 and Round 2 offshore wind farms.

Potential Impact	**Release of contaminants bound in sediments**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Trophic web To determine potential contaminants bound in the sediments the following studies and surveys are proposed: Desk top study of historical contaminants within the surrounding seabed. If historical contamination is identified then it may be necessary, following discussions with statutory authorities to undertake: Chemical analysis of sediments
Method of Impact Assessment	The data obtained during the desk study (and intertidal benthic survey) will be used to assess the likelihood of sediment contamination using standard EIA methodologies and comparison against Canadian Interim Sediment Quality Guidelines and CEFAS Action Levels In Dredged Materials.

Potential Impact	**Temporary sediment disturbance due to export cabling**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Intertidal benthic habitats and species To determine temporary disturbance effects on intertidal habitats and associated communities the following studies and surveys are proposed: Intertidal biotope survey
Method of Impact Assessment	Potential impacts through direct habitat / community disturbance will be assessed via quantifying % of certain biotopes/habitats potentially affected, previous experience gained during the assessment of Round 1 and Round 2 OWF and standard EIA methodologies.

5.2.5.5 SITE-SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The following references provide best practice guidance for use in assessing impact upon benthic ecology:

- Davies *et al*. (2001). Marine Monitoring Handbook
- Wyn G, & Brazier P. 2001. Procedural Guideline No 3-1. In-situ intertidal biotope recording. In Marine Monitoring Handbook (pp 223-228).
- NMMP (2003). National Marine Monitoring Programme Green Book. V7.
- CEFAS (2004). Offshore Wind Farms: guidance notes for Environmental Impact Assessment in respect of FEPA and CPA requirements. Version 2

- DEFRA (2005) Nature conservation guidance on offshore wind farm development
- OSPAR (2008). OSPAR Guidance on Environmental Considerations for Offshore Wind Farm Development
- IEEM (2009). Guidelines for Ecological Impact Assessment in Britain and Ireland - Marine and Coastal Consultation document
- Hiscock K, (1996). Marine Nature Conservation Review: rationale and methods. Coasts and seas of the United Kingdom (MNCR series) JNCC

SURVEY DESIGN

A phase 1 biotope mapping survey is proposed at each of the potential landfall sites, to record and map habitats and associated biological communities (biotopes), together with descriptive accounts of environmental features and appropriate photography.

The survey area will encompass an area extending 200 m either side of the proposed cable route at each proposed landfall site. In order to ensure access to the lowest reaches of the shore, surveying will be undertaken on low spring tide occasions. Work will commence just after high tide with surveyors working down the shore following the receding tide, with the aim to surveying the entire vertical range of the shore during one tide. Dig-over of sediments will be undertaken to look for conspicuous characterising species which will be identified *in-situ* and their abundance estimated using the SACFOR abundance scale (Hiscock, 1996).

Samples for determination of sediment chemistry will be transferred to a UKAS accredited laboratory for analysis (specific determinants to be agreed with Marine Scotland and SNH/JNCC).

DATA ANALYSIS

Field data will be used to support development of an intertidal biotope map showing the extent of ecological resources within the potential influence of the cable installation activities at each possible landfall location.

5.2.5.6 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

The methodologies and potential survey requirements by which cumulative and in-combination effects will be assessed will be agreed with consultees. The cumulative and in-combination assessment methodology described in section 5.2.2.6 (Benthic Ecology) is also of relevance for this discipline.

5.2.5.7 POTENTIAL MITIGATION METHODS

Potential mitigation measures for marine benthic impacts include micrositing the cable around features and choice of installation techniques.

The mitigation measures proposed for the final OFTO infrastructure will be dependent upon the final design and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.2.6 TERRESTRIAL ECOLOGY

5.2.6.1 BASELINE ENVIRONMENT

The north Aberdeenshire landscape surrounding MORL's proposed cable route corridors is highly modified, largely comprising flat, well-drained agricultural fields broken by villages, minor roads and small blocks of forestry plantation. Agricultural habitats are likely to support good assemblages of farmland passerines, waders and geese, and possibly badgers, while the network of watercourses may support otter, freshwater pearl mussel and water vole. The relatively high human population density combined with a long history of farming in the area suggests the presence of many manmade structures suitable for bats. Red squirrel, pine marten and wildcat are unlikely to be present due to a lack of mature or, well-connected native woodland.

DESIGNATED CONSERVATION SITES

Scotland's suite of designated conservation sites, which provide statutory protection for flora and fauna, include:

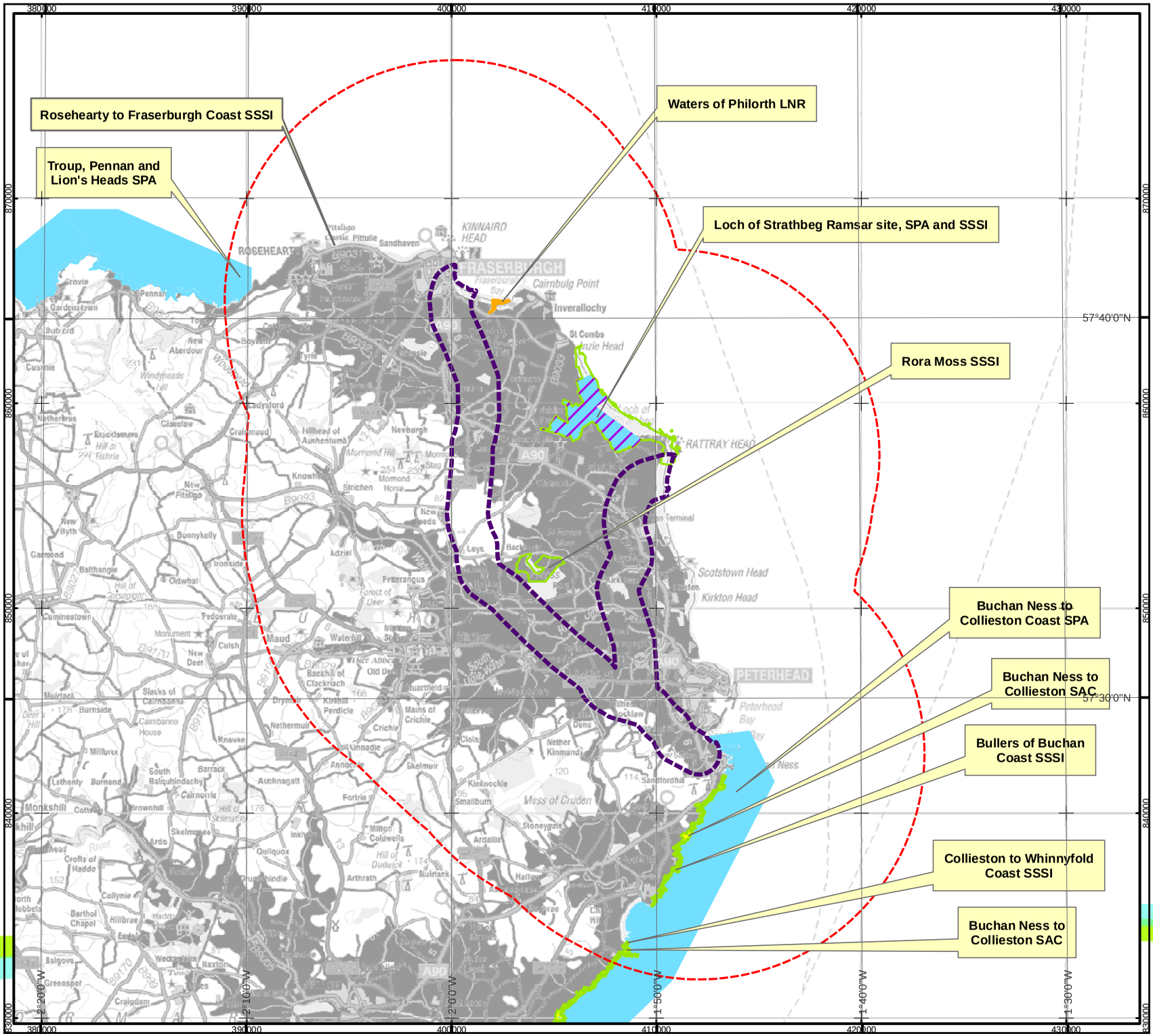
- Internationally protected Ramsar sites;
- European protected Special Protection Areas (SPAs) and Special Areas of Conservation (SACs); and
- Nationally protected Sites of Special Scientific Interest (SSSIs).

The potential effect of a proposed development upon such protected sites and their features of interest require careful consideration. If sites of international or European importance are potentially affected, then SNH's advice will be required. If there is indication of a Likely Significant Effect (LSE) on international or European designated sites, then SNH/JNCC may advise the Competent Authority (Aberdeenshire Council) that an Appropriate Assessment is required.

Two designated conservation sites are within the immediate vicinity of MORL's proposed cable route corridors (Figure 5-14):

- MORL's proposed cable route corridors overlap the Loch of Strathbeg SSSI by approximately 535 m at Rattray Head ; and
- MORL's proposed cable route corridors lie adjacent to the Buchan Ness to Collieston Coast SPA at Boddam.

In addition, the surrounding north Aberdeenshire landscape contains a further eight designated conservation sites within 10 km of the proposed cable route corridors. There are, therefore, a total of ten designated conservation sites within 10 km of MORL's proposed cable route corridors (Table 5-3). The possibility that species of conservation interest to these sites may use the proposed development area for foraging will be investigated through desk and field study (specifically the foraging distribution of pink-footed geese roosting at the Loch of Strathbeg Ramsar site, SPA and SSSI).



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REPSOL

Moray Offshore Renewables Ltd

Key

- OFTO Onshore Study Area
- Cable route corridors 10km buffer
- Special Protection Area
- Special Area of Conservation
- Ramsar site
- Site of Special Scientific Interest
- Local Nature Reserve

Horizontal Scale: 1:250.000 (0 2.500 5.000 Meters)

A4 Chart

N

Geodetic Parameters: British National Grid (OSGB36)

Produced: JJL
Reviewed: KC
Approved: RH

Date: 18/06/2011 | Revision: A

REF: 8460001-PSO0010-RPS-MAP-001

Fig: 5-14 Designated Sites (of Terrestrial Interest)

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Table 5-3: Designated Sites Within 10 km of MORL's Onshore Cable Route Study Area

Site	Minimum Distance From MORL's Proposed Route Corridors	Relevant Ramsar Qualifying Feature/SPA Qualifying Feature/SSSI Notified Feature (* indicates assemblage qualifier only)
Buchan Ness to Collieston Coast SPA	Adjacent to MORL's proposed cable route corridors	- Breeding seabird assemblage, 95,000 seabirds. - Nationally important population of breeding fulmar, 1,765 pairs, 0.3% of British population. - Nationally important population of breeding guillemot, 8,640 pairs, 1.2% of British population. - Nationally important population of breeding herring gull, 4,292 pairs, 2.7% of British population. - Nationally important population of breeding kittiwake, 30,452 pairs, 6.2% of British population. - Nationally important population of breeding shag, 1,045 pairs, 2.7% of British population.
Rora Moss SSSI	170 m from MORL's proposed cable route corridors	- Raised bog
Loch of Strathbeg SSSI	Overlaps MORL's proposed cable route corridors by approximately 535 m	- Breeding bird assemblage - Eutrophic loch - Fen meadow - Open water transition fen - Wintering pink-footed goose; whooper swan; greylag goose; goldeneye; goosander; mute swan; pochard; tufted duck; wigeon
Buchan Ness to Collieston SAC	560 m from MORL's proposed cable route corridors	- Internationally important vegetated sea cliffs.
Bullers of Buchan Coast SSSI	560 m from MORL's proposed cable route corridors	- Breeding seabird assemblage - Maritime cliff - Guillemot - Kittiwake - Shag
Waters of Philorth LNR	730 m from MORL's proposed cable route corridors	*Site Description:* - Waters of Philorth is small scale estuarine environment including small area of salt marsh and sand spit. Dunes at Philorth are youngest of Fraserburgh system developing in 1930s and continuing to develop eastwards. Sand dune system holds vegetation, saltmarsh and reedbeds attracting variety of waders, wildfowl and seabirds. Reedbeds are important breeding sites providing shelter and food for migrating

Site	Minimum Distance From MORL's Proposed Route Corridors	Relevant Ramsar Qualifying Feature/SPA Qualifying Feature/SSSI Notified Feature (* indicates assemblage qualifier only)
		birds. Behind dune ridge is more sheltered dune area with increasing diversity of flowering species of plants which attract butterflies such as the Small Cooper and Small Heath.
Rosehearty to Fraserburgh Coast SSSI	765 m from MORL's proposed cable route corridors	- Non breeding curlew - Non breeding eider - Non breeding purple sandpiper - Non breeding turnstone
Loch of Strathbeg Ramsar site	770 m from MORL's proposed cable route corridors	- Wintering waterfowl assemblage - Eutrophic loch - Pink-footed goose - Whooper swan - Greylag goose
Loch of Strathbeg SPA	770 m from MORL's proposed cable route corridors	- Wintering waterfowl assemblage, 32,600 waterfowl. - Wintering pink-footed goose, 27,500 individuals, 25% of total Icelandic/Greenlandic population, all of which winter in Britain. - Internationally important population of wintering whooper swan, 245 individuals, representing 1% of total Icelandic population and 4% of total whooper swans wintering in Britain. - Wintering greylag goose, 5,565 individuals, 6% of total Icelandic population, all of which winter in Britain. - Nationally important population of breeding sandwich tern, 280 pairs. - Wintering teal, 1,270 individuals, 1% of British wintering population. - Wintering goldeneye, 150, 1% of British population. - Barnacle goose.
Troup, Pennan and Lion's Heads SPA	8.7 km from MORL's proposed cable route corridors	- Breeding seabird assemblage, 150,000 seabirds. - Fulmar*, 4,400 pairs. - Internationally important population of breeding guillemot, 44,600 individuals, 4% of British population. - Herring gull*, 4,200 pairs, 2% of British population. - Internationally important population of breeding kittiwake*, 31,600 pairs, 6% of British population. - Razorbill*, 4,800 individuals.

Site	Minimum Distance From MORL's Proposed Route Corridors	Relevant Ramsar Qualifying Feature/SPA Qualifying Feature/SSSI Notified Feature (* indicates assemblage qualifier only)
Collieston to Whinnyfold Coast SSSI	8.8 km from MORL's proposed cable route corridors	- Breeding seabird assemblage - Maritime cliff - Fulmar - Guillemot - Kittiwake - Razorbill - Shag

5.2.6.2 DATA GAPS

Site specific surveys will be required to determine the extent and distribution of species and habitat receptors including Annex I habitats and species.

5.2.6.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on terrestrial ecology as a result of the proposed OFTO infrastructure:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Disturbance leading to displacement of terrestrial and freshwater fauna (activities associated with cable burying/ substation construction, repair/maintenance and decommissioning)	✓	✓
Loss of terrestrial habitat (and associated potential loss of breeding and foraging habitat) through construction of onshore substation, and (temporary) loss due to onshore cable laying activities	✓	✓
Potential release of pollutants during construction activities e.g. from accidental spillage/leakage affecting freshwater habitats and associated fauna	✓	✓

5.2.6.4 IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a study and method of impact assessment is described in the tables below.

Potential Impact	**Disturbance leading to displacement of terrestrial and freshwater fauna (activities associated with cable burying/ substation construction, repair/maintenance and decommissioning)**
Survey/Study Proposed to Assess Impact	Potential sensitive receptors include: - Regional, national and international terrestrial and freshwater faunal communities To determine potential for disturbance and displacement, the following surveys and studies will be undertaken: Desk top study existing fauna in the proposed development area, including wintering birds, coastal birds, protected species of conservation concern Breeding bird surveys Bat roosting and habitat foraging suitability survey Otter survey Water vole survey Badger survey Freshwater pearl mussel survey
Method of Impact Assessment	Species density, distribution and behavioural data will be used to assess the likely impacts of disturbance on terrestrial/freshwater fauna.

Potential Impact	**Loss of terrestrial habitat (and associated potential loss of breeding and foraging habitat) through construction of onshore substation, and (temporary) loss due to onshore cable laying activities**
Survey/Study Proposed to Assess Impact	Potential sensitive receptors include: - Regional, national and international habitat communities - Regional, national and international terrestrial and freshwater faunal communities To determine potential for disturbance and displacement, the following surveys and studies will be undertaken: Desk top study existing fauna in the proposed development area, including wintering birds, coastal birds, protected species of conservation concern Breeding bird surveys Bat roosting and habitat foraging suitability survey Otter survey Water vole survey Badger survey Freshwater pearl mussel survey
Method of Impact Assessment	Species density, distribution and behavioural data will be used to assess the likely impacts of habitat loss on terrestrial/freshwater animal and plant communities.

Potential Impact	**Potential release of pollutants during construction activities e.g. from accidental spillage/leakage affecting freshwater habitats and associated fauna**
Survey/Study Proposed to Assess Impact	Potential sensitive receptors include: - Regional, national and international freshwater habitat communities - Regional, national and international freshwater faunal communities To determine potential for disturbance and displacement, the following surveys and studies will be undertaken: Desk top study existing fauna and flora in and around freshwater and wetland habitats Freshwater pearl mussel survey Otter survey Water vole survey Phase 1 habitat survey
Method of Impact Assessment	The potential impact of the release of pollutants will be assessed in the EIA using standard EIA methodologies and previous literature, taking consideration of the likely mitigation measures. Potential for accidental spillage or leakage to be mitigated by correct servicing and maintenance of equipment, together with adherence to best practice and appropriate Pollution Prevention Plans, Site Environment Plans and onsite monitoring/reporting.

5.2.6.5 SITE SPECIFIC METHODOLOGY

BEST PRACTICE GUIDANCE

- SEPA's Pollution Prevention Guidelines:
- PPG 1 General guide to the prevention of pollution
- PPG 2 Above ground oil storage tanks
- PPG 5 Works and maintenance in or near water
- PPG 8 Safe storage and disposal of used oils
- SNH. Otters and Development: http://www.snh.org.uk/publications/on-line/wildlife/otters/default.asp
- SNH. Badgers and Development: http://www.snh.org.uk/publications/on-line/wildlife/badgersanddevelopment/development.asp
- Forestry Commission Scotland. Forest Operations and Red Squirrel in Scottish Forests. FCS Guidance Note 33, November 2006

No specific guidance has been set out by SNH for ecological survey of land proposed for underground cable construction. As such, SNH's guidance document on assessment of significance of impacts from onshore wind farms in areas outside designated sites (SNH, 2006a) has been referred to instead. This guidance provides advice on assessing impacts on Annex I birds in the wider countryside using Natural Heritage Zone (NHZ) populations. A second SNH document referred to provides guidance on European and national legislation and government policy (SNH, 2006b), which supports the former document by detailing the legislative requirements underpinning the assessment of significance of impacts in areas outside designated sites.

As MORL's proposed cable will be underground, there is no risk of collision with birds; flight activity surveys are therefore not included in the proposed suite of surveys. Further, as agreed in a meeting with SNH (28 February 2011), great crested newt and reptile surveys are also not required.

BREEDING BIRD SURVEY

This survey was designed to document the presence of breeding birds along MORL's proposed cable route corridors. The data generated will allow estimation of the numbers and locations of breeding territories.

The breeding bird survey will be carried out along both options for the underground cable route: Fraserburgh to Peterhead and Rattray to Peterhead; one section is common to both routes near Peterhead (Figure 5-15). Each option route within the wider study corridors has been flanked by a 250 m buffer to form a corridor. The route therefore comprises three corridors: the Fraserburgh corridor, the Rattray corridor and the Peterhead corridor. To manage the large survey area, these three corridors have been tiled into 59 x 2 km^2 tiles. The Fraserburgh corridor comprises tiles F1-F35, the Rattray corridor comprises tiles R1-R16, and the Peterhead corridor comprises tiles P1-P8. The corridors are 1 km wide, comprising 2 parallel transects 500 m apart, flanked by the 250 m buffer.

Surveyors will walk each transect and record all ornithological activity (species and behaviour) within 250 m to the left and right, thus covering the 1 km width of the corridor. Recordings will be made using standard BTO notation directly onto zoomed-in maps of individual 2 km^2 tiles, on Ordnance Survey 1:10,000 basemaps, provided to surveyors on A3 sheets. Standard CBC methodology will be employed (Gilbert *et al*., 1998). For rarer species it is particularly important that locations are recorded as accurately as possible. Further, where possible an effort will be made to record whether or not rare birds that are not seen simultaneously are in fact different birds or observations of the same birds. Such information will greatly enhance desk-based analysis.

Three visits will be carried out across May and June 2011, between dawn and midday throughout. Surveys will be carried out in good visibility, avoiding persistent rain or fog, excessive cold or heat and wind exceeding Beaufort force 4.

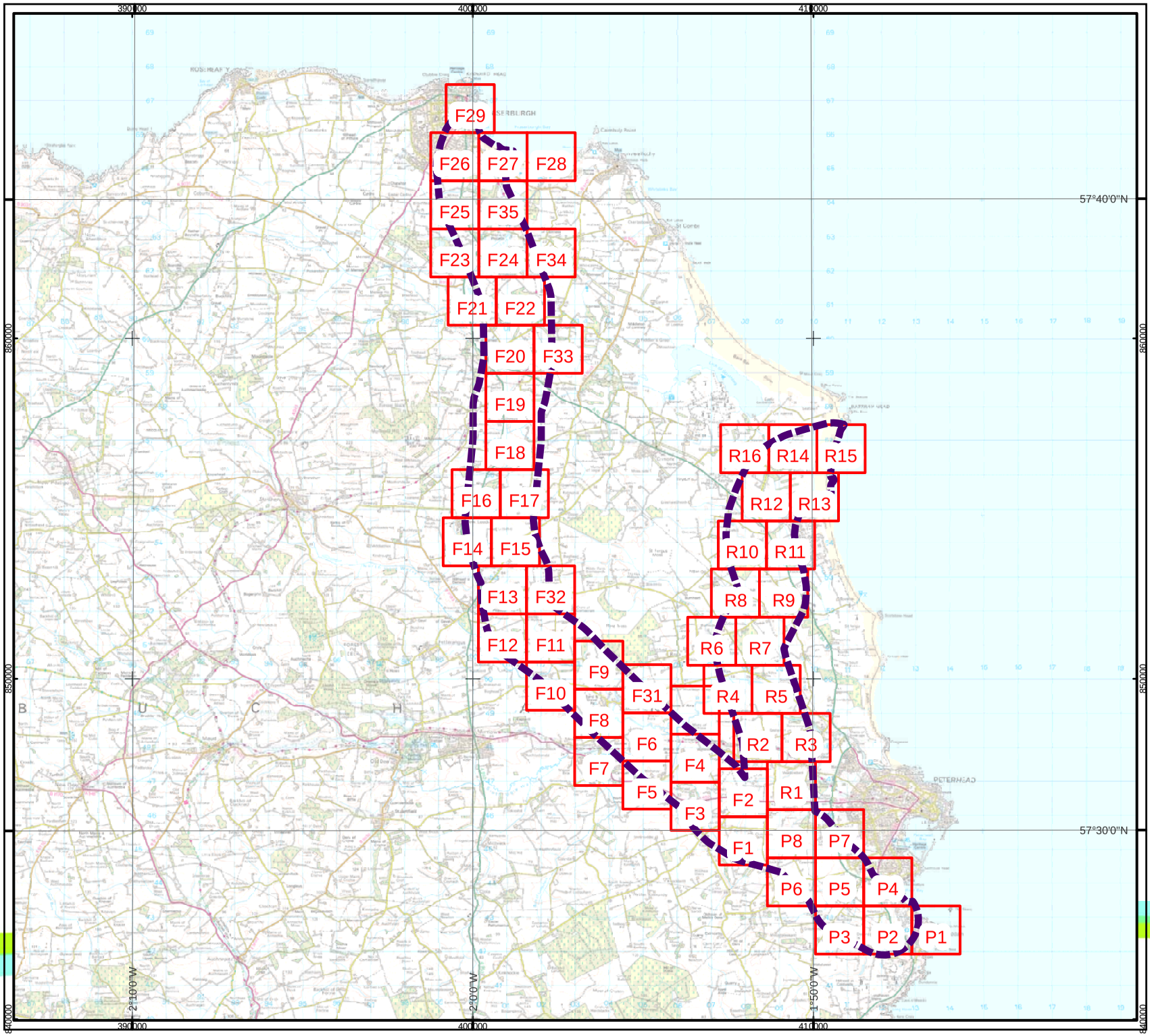
Back in the office, records will be digitised using GIS software, and the resulting combined maps of the three visits will be examined to identify breeding territories. Birds will be assumed to be breeding or holding territory if one or more of the following are observed:

- Displaying or singing;
- Presence of a nest, eggs or young (including newly-fledged);
- Agitated behaviour, specifically alarm calls or distraction display; and
- A territorial dispute.

In the absence of these indicative behaviours, a pair of birds observed together in suitable habitat will be considered to be a breeding pair. Other records will be considered to be non-breeding birds. Within visits, multiple records of the same species within 500 m for waders, or within 200 m for passerines, will be considered to be birds of the same pair; while multiple records separated by more than this distance will be considered to be birds of different pairs. Exceptions may occur where surveyors confirm that multiple records are indeed birds of different pairs, or vice versa; annotations will be made on field maps to indicate whether this is the case.

WINTER BIRD SURVEY (DESK STUDY)

It is not anticipated that winter bird surveys will be required. However, given the proximity of MORL's proposed cable route corridors to the Loch of Strathbeg SPA, a detailed desk study will be carried out to assess the likelihood of the fields surrounding the proposed cable route corridors supporting pink-footed geese during winter months. The desk study will be conducted in association with Dr Ian Patterson, the recognised expert on the geese at Loch of Strathbeg SPA. Should the desk study conclude that there is suitable habitat for geese along the routes, then it may be necessary to undertake some winter walkover surveys to assess the level and distribution of goose foraging along MORL's proposed cable route corridors.



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KEY

OFTO Onshore Study Area

Survey 2km Tiles

Horizontal Scale: 1:150.000 A4 Chart

0 2.500 5.000 Meters

N

Geodetic Parameters: British National Grid (OSGB36)

Produced: JJL
Reviewed: KC
Approved: RH

Date: 18/06/2011 | Revision: A

REF: 8460001-PSO0010-RPS-MAP-002

Fig:5-15 Breeding Bird Survey Overview

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COASTAL BIRD SURVEY (DESK STUDY)

It is not anticipated that coastal bird surveys will be required. However, given that a small section of MORL's proposed cable route corridors overlaps with Loch of Strathbeg SSSI (at Rattray's potential landfall area), and lies adjacent to Buchan Ness to Collieston Coast SPA, a detailed desk study will be carried out to assess the presence of SPA qualifying features/SSSI notified features present at these sections of coast. It is worth noting that the cable will also be buried at the landfall points. The data informing this desk study are available from the Seabird 2000 database and the Wetland Bird Survey (WeBS). SNH will be consulted on the results of the desk study and on the potential requirement for coastal bird surveys.

PROTECTED SPECIES AND SPECIES OF CONSERVATION CONCERN SURVEY (DESK STUDY)

A detailed desk study will be carried out to assess the presence of:

- European Protected Species, protected under the Habitats Directive and Habitats Regulations;
- UK Protected Species, protected under the Wildlife and Countryside Act;
- Species of national conservation concern, protected by the Protection of Badgers Act or listed on the UKBAP and Scottish Biodiversity List (SBL); and
- Species of local conservation concern, listed on the Northeast Scotland LBAP.

Data will be sought from SNH, Biodiversity Recording Groups, Bat Groups, the Badger Network and Forestry Commission Scotland (if their land occurs within the proposed cable route study corridors). The National Biodiversity Network (NBN) will be searched for records of protected species and species of conservation concern. Finally, species distribution maps will be studied to assess which species will require consideration in assessment of potential impacts from the construction / operation / decommissioning of the s proposed cable.

PROTECTED SPECIES SURVEY

MORL's proposed cable routes, as well as potential substation locations (buffered by 100 m), will be searched in detail for field evidence of, or habitats with potential to support, the following European or UK protected species:

- Bats (location of likely roost sites and suitable foraging habitat only);
- Otter (within a 250 m buffer of proposed works);
- Red squirrel (within a 50 m buffer of proposed works);
- Water vole(within a 50 m buffer of proposed works); and
- Badger (within a 200 m buffer of proposed works).

Searches for the presence of pine marten and wildcat will also be carried out. If evidence of either of these species is found, pine marten will be surveyed within a 100 m buffer of proposed works and wildcat within a 500 m buffer.

Sightings or field evidence of protected species, specifically prints, paths, droppings, resting sites (including holts/dreys/burrows/setts/dens) and feeding remains will all be recorded. Photographs and GPS coordinates will be taken to support 'target notes' which will pinpoint these recordings in the field.

It may be necessary to carry out further protected species surveys if sightings, field evidence or habitat potential to support other protected species is found, and to further inform mitigation measures proposed in the Environmental Statement.

FRESHWATER PEARL MUSSEL SURVEY

A meeting with SNH (28 February 2011) highlighted that freshwater pearl mussels have existed historically in one of the rivers which flows through part the onshore cable route study area.. SNH have therefore requested at this meeting that a freshwater pearl mussel survey be carried out to assess whether the species is still present in this river. It has been advised that a 1 km section of the River Ugie be surveyed in the Fraserburgh corridor, and likewise a 1km section in the Rattray corridor.

Initially, habitat with potential to support freshwater pearl mussel will be identified. This will be carried out using a standard habitat scoping study survey form, for which surveyors will assess watercourse conditions, specifically, substrate suitability, algal cover, presence of salmonids, depth, width, gradient, speed of flow and anthropogenic effects (e.g. pollution). The general conditions used to determine habitat with potential to support freshwater pearl mussel will follow standard SNH guidelines and will also be based on professional judgement.

The habitat scoping study survey form will assess the river's potential to support freshwater pearl mussel according to the following:

- Mussels present (dead or alive);
- Suitable;
- Sub-optimal; and
- Unsuitable.

Watercourses with mussels present, or graded as suitable or sub-optimal, will be subject to intensive survey for the species. If there is any doubt over whether the watercourse may support freshwater pearl mussel, then it will be intensively surveyed.

PHASE 1 HABITAT SURVEY

An assessment of the nature conservation baseline and importance of all habitats will be undertaken according to standard Phase 1 Habitat Survey. This includes identification of important higher plants and locations of important bryophyte communities. This method provides a standard system for classifying and mapping the wider countryside (including urban areas), and ensures that surveys are carried out to a consistent level of detail and accuracy. It is considered that this methodology provides a robust means of describing and assessing vegetation, and is fit for purpose.

The Phase 1 Habitat Survey will be carried out between May-August. Habitat type and extent will be defined across the survey area following standard guidelines set out by the Joint Nature Conservation Committee (JNCC, 2007). The survey area will incorporate MORL's proposed cable routes buffered by 200 m.

Plants protected under Schedule 8 of the Wildlife and Countryside Act and plants of national nature conservation importance will be recorded.

Invasive exotic plants, specifically Japanese knotweed (*Fallopia japonica*), Himalayan balsam (*Impatiens glandulifera*) and giant hogweed (*Heracleum mantegazzianum*), will be recorded. This will ensure that these plants and their locations will be identified during the EIA and prior to construction, allowing special measures to be implemented to attempt to prevent their spread into the wider countryside, which is a requirement of the Wildlife and Countryside Act.

Surveyors will make an assessment of semi-natural habitats during progression of the Phase 1 Habitat Survey, so that the most important examples of each habitat can be identified. The assessment will be based on primary evaluation criteria outlined by Ratcliffe (Ratcliffe, 1977), and will involve consideration of each habitat's naturalness, size, rarity, diversity and position in an ecological unit.

Where a habitat type is considered important or where a combination of habitats will be considered to be important, they will be listed as Important Habitat Areas (IHAs). A National Vegetation Classification (NVC) survey will also be undertaken in these areas following the methodology outlined by Rodwell (2006).

5.2.6.6 Cumulative and In-combination Impact Assessment & Survey Methodologies

The methodologies and potential survey requirements by which cumulative and in-combination effects will be assessed will be agreed with relevant consultees.

5.2.6.7 Potential Mitigation Methods

Potential mitigation measures for terrestrial ecology impacts include micrositing the onshore substation and cable route around areas of high ecological importance and using best practice measures during construction (e.g. presence of Ecological Clerk of Works during construction in areas of particular sensitive habitats or if works are carried out during sensitive times of the year for specific species/group of species, such as during the breeding season).

The mitigation measures proposed will be dependent upon the final design of the project (i.e. onshore cable route and onshore substation location) and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.2.7 Ornithology (Offshore)

5.2.7.1 Baseline Environment

The Moray and Aberdeenshire coasts and offshore waters are host to internationally-important numbers of breeding seabirds and over-wintering waterbirds (e.g. seaducks, diving ducks, divers, grebes and waders), and are important for feeding during the spring and autumn migrations of species that breed at high latitude. As recognition of this there are a number of sites in this area which are designated for their ornithological interests. These include international-level Special Protection Areas (SPAs) and Ramsar sites, and national Sites of Special Scientific Interest (SSSIs).

The Moray and Aberdeenshire coastlines are important areas for seabirds, supporting internationally- and nationally-important breeding populations of fulmar, shag, herring gull, kittiwake, guillemot and razorbill. The Moray and Aberdeenshire coasts are also recognised as being important sites for seaduck. Designated sites with species which have the potential to forage within the cable route study area are:

- Troup, Pennan & Lion's Head SPA
- Gamrie and Pennan Coast SSSI
- Rosehearty to Fraserburgh Coast SSSI
- Loch of Strathbeg SPA
- Buchan Ness to Collieston Coast SPA
- Bullers of Buchan Coast SSSI
- Collieston to Whinnyfold Coast SSSI.

The details on the designating features for each of the above sites are listed in Table 5-3 (section 5.2.6 Terrestrial Ecology) and shown in Figures 5-13 and 5-14.

Due to the nature of the potential risks posed by the construction of an offshore power cable the target species for this assessment will be those which may forage within the study area. This will therefore exclude species (such as geese, swans and waders) that will only occur in the study area in flight, either on migration or commuting between foraging/roosting/loafing areas. The waters of the outer Moray Firth and the nearshore waters off the Moray and Aberdeenshire coasts are important feeding areas for seabirds and seaduck (Tasker, 1996). Of the seabirds, fulmars are widely distributed in the offshore cable route study area throughout the year, whilst gannet, kittiwake and auk numbers peak during the summer or autumn. The surrounding coastal waters are of particular year-round importance for shags and herring gulls (DTI, 2004; DECC, 2009b). Table 5-4 summarises the seasonal seabird distribution and abundance in the offshore cable route study area.

Table 5-4: Summary of seasonal seabird distribution and abundance in the offshore cable route study area.

Month	Distribution & Abundance
January/February	Guillemots are abundant in the Moray Firth throughout the winter. The same is also the case for fulmar, which start to form territories at colonies from January. Numbers of herring and great black-backed gulls peak around this time, particularly in coastal areas.
March	Many seabirds, including gannet, kittiwake, herring gull, guillemot, razorbill and puffin, return to the vicinity of their colonies in early Spring. The highest densities of fulmar are also around the main breeding areas. Herring and great black-backed gulls remaining in area include breeding birds.
April	Egg-laying will commence towards the end of this month for some seabirds, such as gannet and the auks. Foraging will take place both close to colonies and further offshore. Fulmar, gannet and kittiwakes remain will widely distributed areas across the area, with the large densities found near colonies. Arctic and common terns will migrate through the area en route to breeding colonies.
May	Egg-laying will continue for those species also underway, and will commence for the remaining seabirds, such as fulmar and kittiwake. Birds can still

	forage at distances further from the colonies than during chick rearing (e.g. auks up to 60 km and kittiwakes up to 120 km).
June	Peak of breeding season, with chicks starting to hatch for most species. The majority of seabirds are in coastal areas, e.g. most breeding guillemots do not feed further than 30 km from their breeding site, and razorbill forage closer to shore than guillemots. At the end of month guillemot chicks start to leave colonies and disperse offshore.
July/August	The nesting season for most seabird species ends by mid-July, and adult and juvenile birds start to move south to wintering grounds or move to areas where they form moulting flocks. In July/August offshore areas will support larger densities of birds than at any other time of the year. Young fulmar and gannet start to fledge in August.
September	Distribution of auks spreads outwards into North Sea: guillemot will remain in near- and offshore areas but the majority of puffin and razorbill will be further offshore. Numbers of shearwaters (Manx and sooty) and skuas (mainly great and Arctic) will peak around this time. Fulmars will continue to be numerous.
October/November/ December	Seabirds such as guillemot and fulmar continue to the abundant throughout the winter. Smaller numbers of other auks, gannet and kittiwake may also be present. The numbers of herring and greater black-backed gulls will increase during the winter.

Source: DECC (2009b), Mudge & Crooke (1986), Tasker & Pienkowski (1987), Skov *et al*., (1995)

DATA FROM ROUND 3 ZONE 1 BIRD SURVEYS

Between April 2010 and March 2012, boat-based ornithological surveys are being undertaken to gather information on bird activity to inform the EIA for the Eastern Development Area of MORL's Round 3 Zone 1.

The most commonly recorded species have been guillemot, kittiwake, fulmar, razorbilll, gannet, puffin, Arctic tern, great black-backed gull and herring gull. Most of these species were recorded in highest numbers between the spring to late summer period. Several species have been recorded less frequently, including sooty shearwater, Manx shearwater, storm petrel, Arctic skua, great skua, lesser black-backed gull and little auk.

AERIAL DATA

Seven aerial surveys have been undertaken over the Moray Firth Round 3 zone in 2009 (May, June August, November and December) and 2010 (two in February). The first three surveys were undertaken by HiDef Aerial Surveying, and the remaining surveys by WWT Consulting. The surveys covered the entire Round 3 zone plus a 4 km buffer.

The key findings from these data for the Phase 1 development area are:

- The most frequently recorded bird species / species groups in this area were auks, with high numbers of fulmar, kittiwake and other gulls also recorded.
- Other bird species recorded within the Moray Firth site included gannet, along with very low numbers of divers, Leach's petrel, Arctic skua, great skua, and unidentified terns.
- Seasonal variations in bird numbers present within the Moray Firth site included: increasing numbers of fulmar in November compared to other months; highest numbers of gannet and

kittiwake in June and August, with low numbers during the winter; and higher numbers of auks during May and June compared to the winter.

Additional aerial surveys are currently being undertaken by MORL which includes parts of the offshore cable route study area. Six surveys are planned to take place between May and July covering the area in Figure 5-16. The data collected from these surveys will include: species, location, date, time, count, and behaviour.

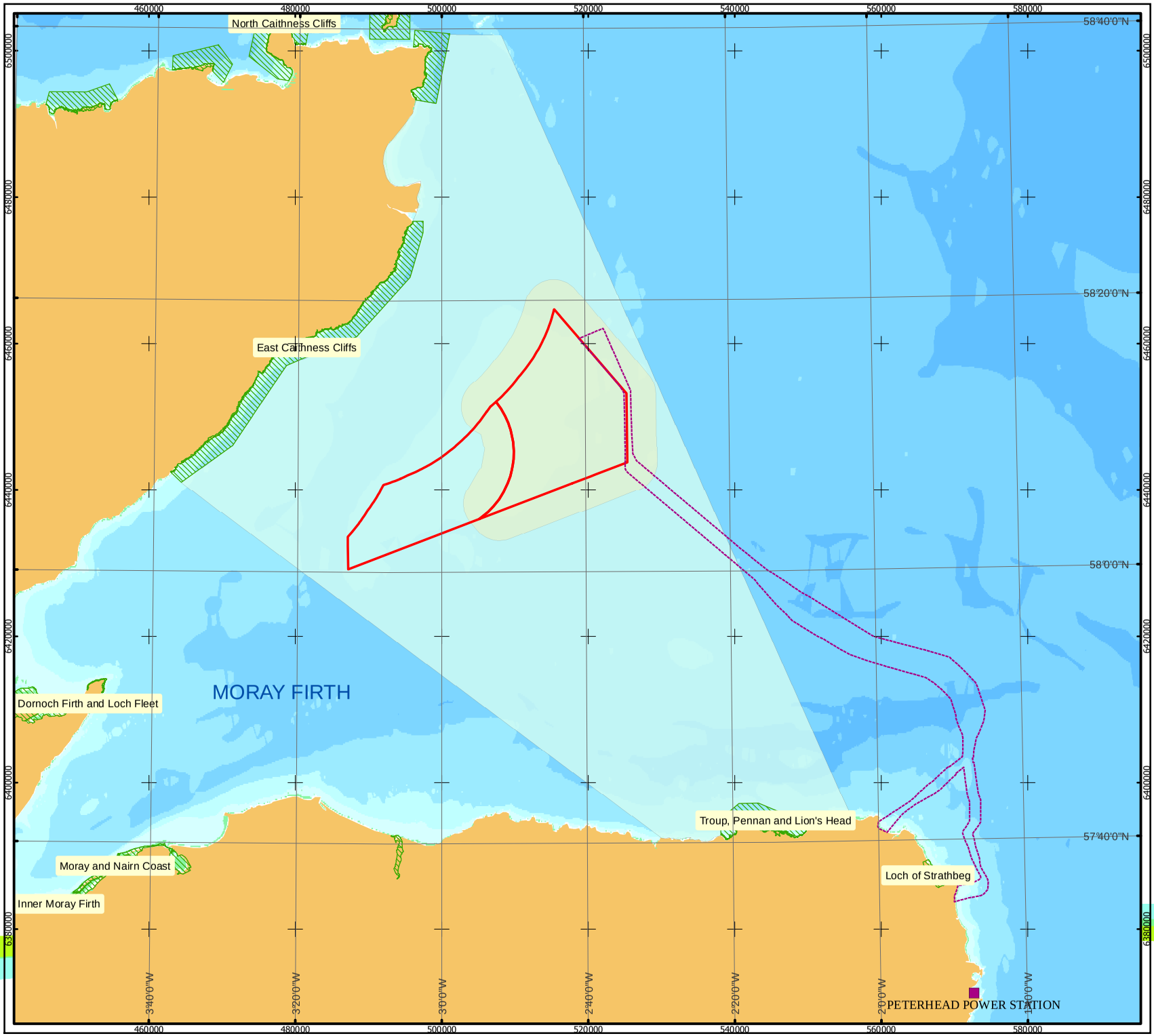
5.2.7.2 DATA GAPS

There is an extensive amount of ornithological data for the Moray and Aberdeenshire offshore area, including survey data currently being collected to support the Round 3 Zone 1 offshore wind farm. While the boat-based surveys will be continued across the wind farm area, and the area for the 2011 aerial surveys overlaps with the cable route study area, no further data are expected to be collected to inform the offshore ornithology impact assessment for the OFTO cable route consent application.

5.2.7.3 ENVIRONMENTAL IMPACT SCOPING

The predicted impacts listed below are based on similar experiences with previous offshore cable routes around the UK coast and in European waters in general.

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Indirect habitat loss and displacement from feeding areas as a consequence of disturbance of marine prey	✓	✓
Disturbance during construction and decommissioning	✓	✓



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KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- Phase 1 Boundary (4km Buffer)
- Additional Survey Area
- SPAs (Moray Firth)

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 21/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-024

Fig:5-16 Offshore Bird Survey Overview

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5.2.7.4 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above the method of impact assessment is described in the tables below.

Potential Impact	**Indirect habitat loss and displacement from feeding areas as a consequence of disturbance of marine prey**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional, national and international bird communities To determine the potential for habitat loss and impacts to prey, the following information will be used: Seabird density and distribution data from Round 3 Zone 1 boat-based and aerial surveys. Survey of marine benthic habitats (see section 5.2.2.5) Information on fish species audiograms to be collected through desk-top study Desk-top study and noise modelling to determine zones of noise around piling operations (for substations) Literature study of bird species foraging habits and changes to marine trophic web associated with offshore power cables
Method of Impact Assessment	The potential for bird species feeding within the cable route study area will be determined by assessing the distribution, density and behaviour data of birds within the area and relating this to literature accounts of species foraging habitats and habitat maps and the density and distribution of marine benthic organisms and fish. The potential impact of construction and maintenance on habitats, benthic organisms and fish species will be determined using available information. The potential impact of increased noise on prey resources will be assessed where audiograms are available for noise sensitive fish and marine benthic species. These impact assessments will be used to assess the potential impact upon the foraging habits of bird species. The potential for impacts will also be assessed with regard to the time of year so that levels of impact may be assessed with regard to different seasonal patterns of use.

Potential Impact	**Disturbance during construction, maintenance and decommissioning** **Disturbance may be initiated by vessels and construction/maintenance activities**
Survey/Study Proposed to Assess Impact	Potentially sensitive receptors include: - Regional, national and international bird communities To determine the potential for disturbance, the following studies will be used: Survey of bird species density and distribution– boat-based and aerial surveys (desk-based assessment of the studies currently being undertaken for MORL's proposed Eastern Development Area) Review of disturbance on birds arising from power cable construction, maintenance and decommissioning activities

Method of Impact Assessment	Bird species density, distribution and behavioural data will be collated to inform likely population densities across different parts of the cable route study area in different seasons. The impact of the anticipated construction, maintenance and decommissioning activities will be assessed in relation to these baseline data. The potential for impacts will also be assessed with regard to the time of year so that levels of impact may be assumed with regard to different seasonal patterns of use.

5.2.7.5 Cumulative and In-combination Impact Assessment Methodologies

The cumulative and in-combination impact assessment will be based on guidance issued by COWRIE (King *et al*., 2009) which uses 'key features' tables to identify a list of species which will be most at risk of cumulative and in-combination impacts.

5.2.7.6 Potential Mitigation Methods

Potential mitigation measures for impacts to birds include: micro-siting of the cable to avoid sensitive habitats; choice of construction techniques; use of standard vessel route; and avoidance of foraging hotspots.

5.2.8 Designated Sites

The designated sites that will need consideration for the offshore generating section have been referred to within relevant sections of this document (according to the designated features of each area).

A description of designated sites relevant to the offshore generating station and offshore transmission infrastructure will be provided in the baseline section of the ES with impact assessment included in the relevant disciplines (ES structure approach to be agreed with relevant stakeholders).

5.3 HUMAN ENVIRONMENT

The effects on the human environment are categorised as follows:

- Commercial Fisheries
- Shipping and Navigation
- Ministry of Defence
- Marine Waste Disposal, Dumping and Dredging
- Offshore Oil and Gas
- Subsea Cables and Pipelines
- Seascape, Landscape and Visual Receptors
- Archaeology and Cultural Heritage
- Socio-Economics, Recreation and Tourism
- Noise
- Traffic and Transport

5.3.1 DATA SOURCES

The following data sources provide information on the existing human environment at the current time:

General:
- Marine Scotland Science (formerly known as Fisheries Research Services)
- UK Offshore Energy Strategic Environmental Assessment, DECC
- SEA 5: Strategic Environmental Assessment of parts of the northern and central North Sea to the east of the Scottish mainland, Orkney and Shetland, DTI
- Economic Assessment of Short Term Options for Offshore Wind Energy in Scottish Territorial Waters: Costs & Benefits to Other Marine Users and Interests (Marine Scotland)
- Department of Energy and Climate Change (DECC)
- Scottish Government
- The Crown Estate
- The Beatrice Demonstrator project Environmental Statement
- Renewable UK (formerly the British Wind Energy Association)
- Scottish Natural Heritage (SNH)
- Joint Nature Conservation Council (JNCC)
- The National Trust
- Local Planning Authorities
- Universities

Additional sources for:

Commercial Fisheries –
- Scottish Fishermen's Federation
- North-east Inshore Fisheries Group
- National Fishermen's Federation Organisation
- Regional SFF affiliated fishermen's associations and produced organisations
- Local non-affiliated fishermen's associations, groups and individual skippers

- Marine Scotland District Fisheries inspectors
- Local harbourmasters
- Marine and Fisheries Agency
- SeaFish
- Fisheries Society of the British Isles
- Association of Salmon Fisheries Boards
- Local ports merchants and agents
- UK Oil and Gas (UKO&G)
- International Council for Exploration of the Seas
- EU Fisheries Committee Publications and Data Sets (Europa & Eurolex)
- Foreign National Fisheries Agencies (identified through the course of the EIA)

Commercial Navigation –
- Chamber of Shipping
- Marine and Coastguard Agency
- Northern Lighthouse Board
- Royal National Lifeboat Association
- Pilotage Association
- Forth Ports and other local port operators

5.3.2 COMMERCIAL FISHERIES

5.3.2.1 BASELINE ENVIRONMENT

Assessment of the fisheries baseline provided below is based primarily upon fisheries data (MFA Fisheries Statistics, 2000-2009) collected for all commercial fishing vessels by ICES rectangles, and a dataset produced by Marine Scotland Science (MSS) (MFA Fisheries Statistics, 2000-2009) showing the distribution of commercial fishing landings from vessels exceeding 15 m in length, by weight and value.

ICES statistical rectangles are currently the smallest area statistical units used for the collation of fisheries data. Rectangle boundaries align to 1° longitude and 30’ latitude and for the most part have sea areas equating to approximately 900 nm. The proposed offshore transmission infrastructure is located within ICES rectangles 45E7, 44E7 and 44E8. The very large sea area these rectangles comprise relative to the cable route and the potential of discrete, small-scale fisheries to occur is noted.

All EU fishing vessels over 15 m in length are required to be satellite monitored (Vessel, Monitoring System, VMS), their positions recorded on a 2 hourly basis. The MSS dataset links VMS data to landings data. As a result of vessels under 15 m not currently being required to be monitored, the activity of this fleet may not be represented in this dataset.

Scallops account for over half of the landings, by value, in offshore rectangle 45E7, and *Nephrops* and demersal fish species (haddock and monks principally) comprise a third. *Nephrops* are the principal species landed in 44E7, accounting for almost half of the total landings, with squid, scallops and haddock and monks comprise the large majority of the remaining landings, by value. In 44E8,

within which both cable landfall options are located, haddock, *Nephrops*, edible crab and scallops are the four principal species landed, by value.

Scallops are targeted by vessels towing toothed dredges attached to beams towed over the seabed. *Nephrops* are a burrowing shellfish targeted by both demersal trawlers and potting (creel) vessels. The principal methods for targeting demersal species such as haddock and monks are demersal trawlers and Scottish seines (flydraggers). Squid is principally targeted by the demersal trawl fleet using modified gear, or alternatively by 'jiggers' (a series of barbed lures attached to a vertically dropped line which is 'jigged' up and down). Crab and lobster are caught using baited pots (creels) set on the seabed.

The scallop fishery predominantly occurs in areas of the Smith Bank, and inshore along the south coast of the Moray Firth. The scallop fishery is cyclical and grounds are often left to recover from intensive fishing periods while the fleet targets grounds elsewhere. The *Nephrops* fishery is concentrated in muddier substrates in the southern half of the Moray Firth and is the most valuable fishery in the Moray Firth. The squid fishery is seasonally important in the Moray Firth and landings are predominantly recorded in inshore areas along the south coast.

There are relatively very low recorded landings values of pelagic species in the Moray Firth, although there is a seasonal mackerel fishery targeted by inshore vessels.

Analysis of fishing effort by vessel category (2000-2008) shows that the large majority of fishing effort within offshore rectangle 45E7 is undertaken by vessels greater than 15 m in length. Activity by the 10-15 m and under 10 m fleets increases in the inshore rectangles, with effort for under 10m vessels high in rectangle 44E8, within which the cable landfall options are located.

As a result of the restrictions placed upon availability of data regarding foreign vessel activity in UK waters, consultation and liaison with fishing interests active in the region will be required to establish the full extent of foreign vessel activity in the area. However, preliminary assessment of obtained data sets (Over-flight sightings, MFA/Marine Scotland) shows there to be very little recorded activity of foreign vessels within the Moray Firth.

5.3.2.2 DATA GAPS

It is considered that sufficient data is available to make assessment for the potential impact to fisheries.

5.3.2.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on commercial fisheries as a result of the proposed OFTO infrastructure within the marine environment:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Presence of seabed obstacles	✓	✓
Adverse impacts on commercially exploited species	✓	✓
Safety issues for fishing vessels and associated fishing activities	✓	✓
Interference with fisheries activities	✓	✓
Restricted or temporary loss of access to fishing grounds	✓	✓

5.3.2.4 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below.

Potential Impact(s)	**Presence of seabed obstacles**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts to gear safety arising from the installation of the cable(s) and associated with the cable itself if not busied in its entire length (including rock dumping), the following survey will be undertaken: Side-scan swathe bathymetry (see section 5.1.4.4)
Method of Impact Assessment	The baseline character of the seabed features will be determined during the EIA stage to understand whether there are any current hazards to fishing gear safety. It is intended that this baseline will be compared to post-construction surveys to identify any hazards to gear safety associated with the construction of the wind farm.

Potential Impact(s)	**Adverse impacts on commercially exploited species** **Interference with fishing activities** **Restricted or temporary loss of access to fishing ground**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts as listed above, the following studies will be undertaken: Description of fisheries in the area Assessment of landings data Assessment of effort data
Method of Impact Assessment	In the case of each impact, the assessment will take account of: - the spatial extent of effect - the duration of effect - the scale of effect - recoverability of the receptor - importance of the receptor

Potential Impact(s)	Safety issues for fishing vessels and associated fishing activities
Survey/Study Proposed to Assess Impact	To determine the potential for impacts to navigational safety, the following study will be undertaken: Navigational risk assessment (see section 5.3.3)
Method of Impact Assessment	A navigational risk assessment will assess the risk associated with ship to ship collision, vessel grounding, collision with wind turbine array infrastructure and the potential impact on communication systems.

5.3.2.5 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The following references provide best practice guidance for use in assessing impact upon commercial fisheries:

- BWEA (2002). Best Practice Guidelines for Consultation for Offshore Renewable Developers
- CEFAS (2004). Guidance note for Environmental Impact Assessment in respect of FEPA and CPA requirements, version 2 – June 2004
- BERR (2008). Fishing Liaison with offshore wind and wet renewables group (FLOWW) recommendations for fisheries liaison
- OSPAR (2008). Guidance on Environmental Considerations for Offshore Wind Farm Development. Reference number: 2003-8

ADDITIONAL INFORMATION

To assist the assessment of potential impacts of the proposed development upon commercial fisheries, consultation will be undertaken with the relevant national and local marine fisheries bodies and fishermen's associations and representatives.

OTHER SURVEYS TO BE USED TO IDENTIFY IMPACTS

- Vessel routing surveys are described in section 5.3.3.5

5.3.2.6 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

In addition to the potential impacts of the development on the existing commercial fisheries baseline, the cumulative and in-combination impacts will be separately considered using the impact assessment methodology provided above.

5.3.2.7 POTENTIAL MITIGATION MEASURES

Potential mitigation measures include cable burial where possible, the consultation with fishing industry on appropriate cable protection measures and on measures to ensure integrity of cable and fishing activities post-installation.

5.3.3 SHIPPING AND NAVIGATION

5.3.3.1 BASELINE ENVIRONMENT

This section presents an overview of the navigational features in the Moray Firth which may be affected by the proposed OFTO infrastructure.

The main ports in the area are Inverness, Cromarty Firth, Peterhead and Invergordon for commercial shipping as well as the busy fishing ports of Fraserburgh, Banff/Macduff and Buckie. It is also noted that the fabrication yards located at Nigg and Invergordon are utilised for constructing offshore structures as well as for refitting offshore drilling rigs. Rigs are often laid up in the Cromarty Firth whilst undergoing refurbishment or awaiting contracts.

Merchant Shipping

Figure 5-17 illustrates the shipping movements in the area based on an Automatic Identification System (AIS) shipping survey performed during winter 2010/2011. (AIS typically covers ships above 300 gross tonnes). It should be noted that this survey was being carried out at MORL's proposed wind farm development area, and therefore with AIS coverage reducing towards the coast, resulting in underestimated densities closer to the coast.

From a commercial vessel perspective, the Moray Firth is generally not a busy area. The main shipping routes in the area are either headed into the Moray Firth and Inverness (e.g. shuttle tankers to the Nigg terminal) or using routes off Rattray Head bound for Pentland Firth and the Northern Isles (e.g. Northlink ferries to both Shetland and Orkney from Aberdeen).

Other routes in the vicinity of the cable route consist of fishing vessels and tankers passing parallel to the Buchan coastline to local fishing ports and Inverness/Cromarty Firth, with a further route identified as being associated with offshore vessels supporting the Beatrice and Jacky Oil Fields passing off Rattray Head from Peterhead and Aberdeen.

It is also worth noting that large tankers anchor in the general area around the proposed cable route whilst awaiting orders.

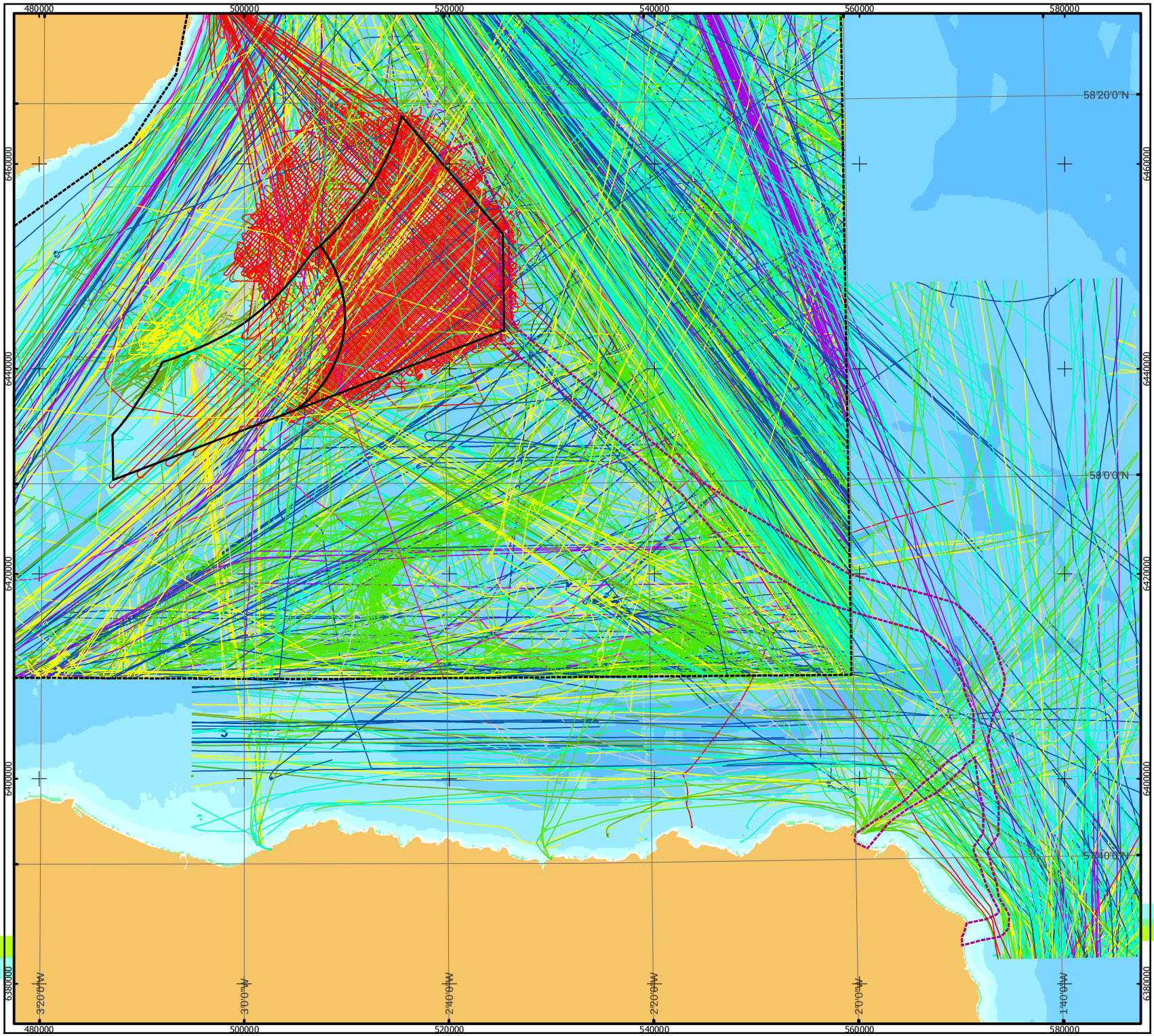
Fishing Vessels

The main fishing activity recorded in the vicinity of the proposed OFTO infrastructure based on fisheries surveillance data (sightings and satellite) is from demersal trawlers, potters and scallop dredgers with a smaller number of pelagic trawlers recorded in the area.

The vast majority of these are UK-registered and associated with nearby Scottish northeast fishing ports such as Banff/Macduff, Buckie, Fraserburgh and Peterhead.

Recreational Vessels

There are a number of recreational vessel activities taking place in the Moray Firth. Marinas are located at various points along the coastline, with the nearest being at Peterhead, Whitehills, Findochty and Buckie.



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REPSOL

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KEY

- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area

AIS Tracks (By Ship Type)

- Fishing
- Military
- Dredger/Subsea
- Tug
- Passenger
- Cargo
- Tanker
- Recreation
- Other Ship
- Unspecified

DATA: 38 Days Winter 2010/11. excluding survey vessel

The apparent high shipping density recorded (RED) within MORL Eastern Development Area and BOWL Development Zone is associated with EIA Studies for the proposed wind farms (Birds & Marine Mammal boat-surveys).

- AIS Core of Survey

Results shown outside 'core area of survey' is indicative only. Survey extents are described in Section: 5.3.3.1

Horizontal Scale: 1:500.000

0 5.000 10.000 Meters

A4 Chart

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-013

Fig: 5-17 Plot of AIS Tracks by Ship Type

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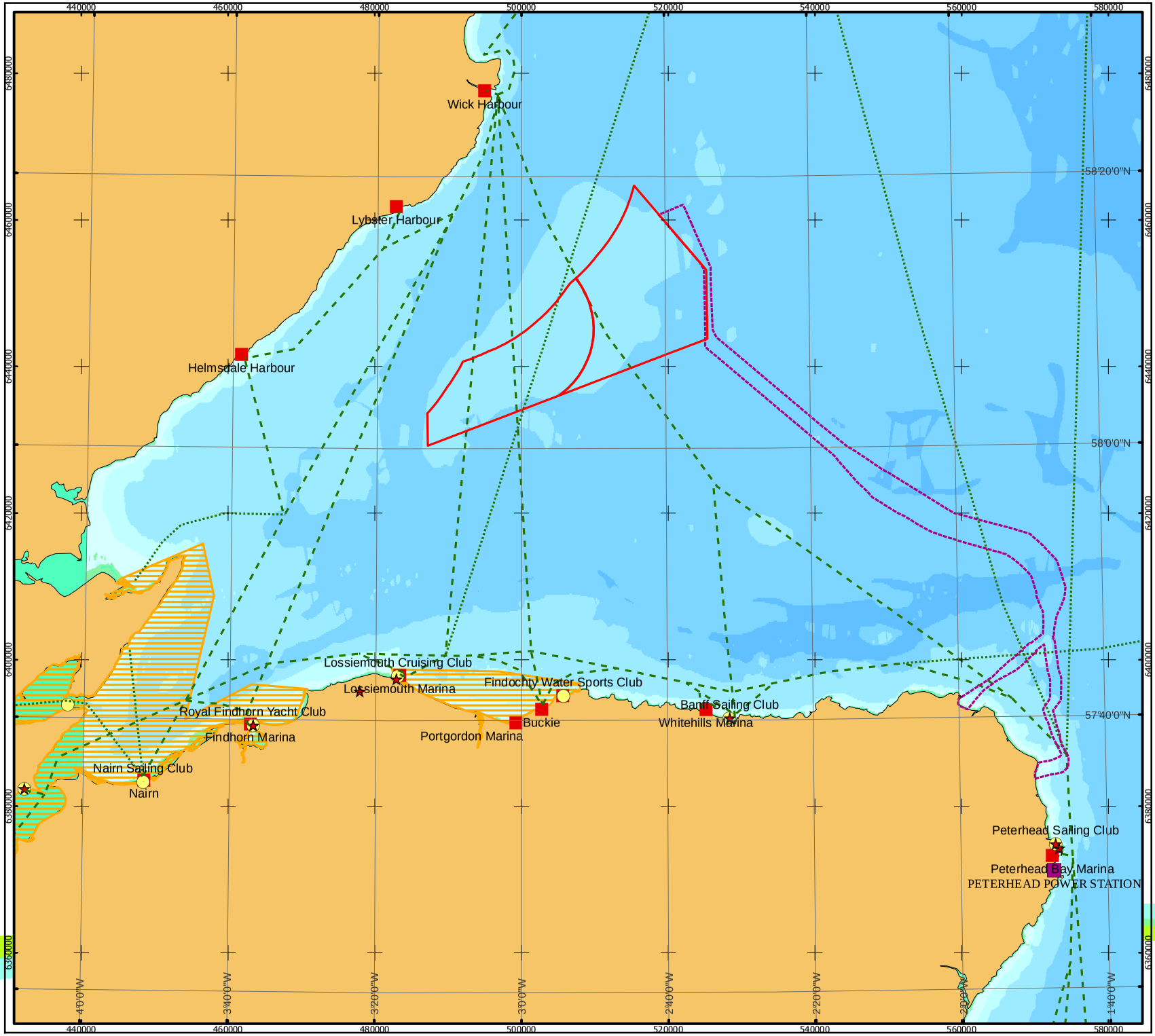

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REPSOL

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KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- Crusing Routes (Heavy use)
- Crusing Routes (Medium use)
- Crusing Routes (Light use)
- Training centre
- Club
- Marina
- Sailing area

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

Produced: CR
Reviewed: RH
Approved: RH

Date: 18/06/2011 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-014

Fig: 5-18 Overview of Navigation Related Recreational Activity

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One medium-use cruising route (i.e. popular routes on which some recreational craft will be seen at most times during summer daylight hours) intersects the edge of the cable corridor and one route off Fraserburgh, between marinas of the Moray Firth and northeast Scotland (e.g. Peterhead, and Stonehaven). There are also three light-use routes (i.e. routes known to be in common use but which do not qualify for medium or heavy classification) intersecting between northeast Scotland and the Northern Isles.

There is also recreational traffic associated with the Caledonian Canal which has a northern entrance at Inverness.

5.3.3.2 DATA GAPS

AIS data for the Moray Firth is available which predominantly covers commercial vessels over 300grt. Increasing numbers of fishing vessels are having AIS fitted and by 31st May 2014 all vessels whose overall length exceeds 15 m are required to have AIS installed.

5.3.3.3 ENVIRONMENTAL IMPACTS SCOPING

Based on experience from previous assessments of offshore wind farm developments, the following are perceived to be the main potential impacts on navigation and shipping as a result of the proposed OFTO infrastructure:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Increased collision risk (vessel to vessel and vessel to construction, vessel) during construction/installation phase	✓	✓
Anchors/fishing gear interacting with cable (emergency anchoring and dragged anchors)	✓	✓
Potential impact on marine navigational equipment, i.e. magnetic compasses	✓	✓

5.3.3.4 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below.

Potential Impact(s)	**Collision Risk** **Risk of Cable Interaction (anchors and fishing gear)** **Potential Impact on Navigational Equipment**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on shipping, a vessel traffic survey of the area will be performed in line with MCA's Marine Guidance Note 371 (M+F): *Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues* This will be used as one of the inputs to the Marine Navigational Risk Assessment which will be carried out as per the recommended methodology outlined in the

	DTI (now DECC) publication Guidance on the *Assessment of the Impact of Offshore Wind Farms: Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms* (the 'DTI Methodology').
Method of Impact Assessment	Survey data to be collected during the cable route survey will be used in the assessment of the impacts listed above. The risk assessment/modelling will be carried out using a formal safety assessment process centred on a hazard workshop and resulting Hazard register.

5.3.3.5 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The assessment will be undertaken in line with the following guidance:

- DTI (2005a). Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms.
- Marine Guidance Note 371: Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues.

Details on survey methods being used to collect data for the zone and the wider Moray Firth are provided in the Eastern Development Area Scoping Report; MORL 2010). These include vessel traffic surveys and a navigational risk assessment.

5.3.3.6 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

Cumulative and in-combination issues associated with the offshore oil and gas activities as well as the adjacent offshore wind farm activities in the area will be evaluated.

The methodologies and potential survey requirements by which cumulative and in-combination effects for MORL's and BOWL's proposed wind farm developments will be assessed has been detailed in a consultation document undertaken on behalf of MORL and BOWL (ERM, 2011a). The shipping and navigation assessment within the consultation report has been split into potential cumulative impacts into hazard risks and operational risks for commercial, fishing vessels and recreational crafts. Hazard risks created from the development include risk of collision, foundering and contact, as well as snagging in the case of fishing vessels. Operational risks include increased fuel and time costs, loss of fishing/sailing area and potential loss of fishing equipment. It is essential that any study includes radar and manual observations, as well as AIS data to ensure all vessels are captured; the Navigational Risk Assessment will also aid in offering a comprehensive evaluation of the development area.

All of the above are also of relevance for the offshore transmission infrastructure cumulative and in-combination impact assessment.

5.3.3.7 Potential Mitigation Methods

Potential mitigation measures for impacts to navigation include:

- cable buried to depth where impairment is less likely;
- monitoring by radar, and/or AIS;
- guard vessels during construction using multi-channel Very High Frequency (VHF) and Digital Selective Calling (DSC); and
- publication of details through Notice to Mariners, inclusion within the cable details in FISHSAFE and chart updates via the UK Hydrographic Office and Kingfisher awareness charts.

The mitigation measures proposed for the development area will be dependent upon the final design and the potential impacts as determined by the Navigation Risk Assessment. Mitigation options will be discussed with the relevant stakeholders prior to ES submission.

5.3.4 Ministry of Defence

5.3.4.1 Baseline Environment

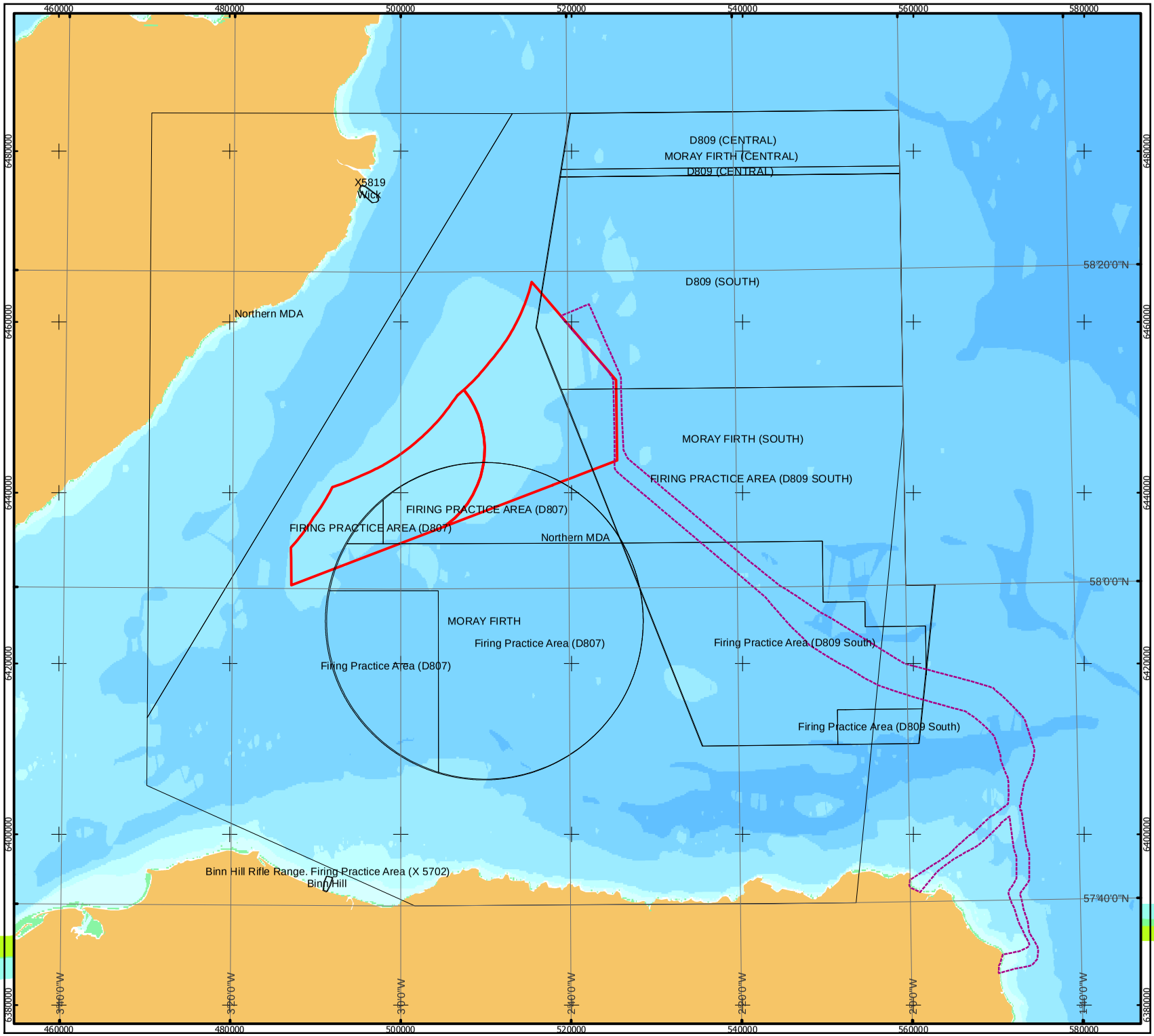
Figure 5-19 illustrates the location of Ministry of Defence (MoD) practice areas within the outer Moray Firth. Most of the offshore export cable study area to the north of the Southern Trench lies within the large Air Force Department Area D712D, used for combat training and high energy manoeuvres at an altitude of 22,000 to 25,000 feet. The proposed cable route is also partly within D809(S), which is used by the Royal Air Force (RAF) for a wide variety of air flying, gunnery and subsurface exercises at altitudes up to 55,000 ft.

The MoD also use the Moray Firth as part of larger marine operations for surface and sub-surface naval activity and exercises.

5.3.4.2 Environmental Impacts Scoping

Based on available literature, the following are perceived to be the potential impacts on the MoD and associated military activities as a result of construction/operation/decommissioning of the OFTO offshore assets:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Creation of obstacles to military operations	✓	



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REPSOL

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KEY

- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- MOD Military Practice Areas

Horizontal Scale: 1:600.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS-84 UTM Zone 30N

Produced: RH
Reviewed: CR
Approved: CR

Date: 17/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-007

Fig: 5-19 MOD Areas

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5.3.4.3 SITE-SPECIFIC IMPACT ASSESSMENT METHODOLOGY

Potential Impact(s)	Creation of obstacles to military operations
Survey/Study Proposed to Assess Impact	To determine the potential for impacts to the creation of obstacles to military operations, the following study will be undertaken: Navigational risk assessment (see section 5.3.3.5)
Method of Impact Assessment	The assessments will be used to investigate the potential risks to military vessels which may pass through the proposed site (mainly during construction associated activities). Aviation issues will be covered by the aviation studies being undertaken for the generating site.

It is not predicted that the offshore substation and offshore export cable interfere with air-based activities. Therefore the potential impact on military aviation activities is **scoped out**.

5.3.4.4 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT & SURVEY METHODOLOGIES

Potential cumulative and in-combination impacts on the MoD may arise from wider military activity in the area, resulting on increased restriction to vessel movement and military operations, mainly during construction.

It is currently anticipated that the navigation cumulative and in-combination impact assessments will cover Ministry of Defence issues.

5.3.4.5 POTENTIAL MITIGATION METHODS

Potential mitigation measures for impacts on the MoD include specialist lighting and markings for the offshore substation, the use of safety zones (if appropriate), guard vessels during construction and publication of details through Notice to Mariners and updates to the UK Hydrographic Office, micrositing of offshore substation and burial of cables.

The mitigation measures proposed for the offshore substation and export cable will be dependent upon the final design of the development and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.3.5 MARINE WASTE DISPOSAL, DUMPING AND DREDGING

5.3.5.1 BASELINE ENVIRONMENT

There are, at present, no licensed areas for dredging aggregates within the Moray Firth. The nearest marine sites from which aggregates have been dredger are in the Firth of Forth (Marine Scotland, 2010). Regular deposition of dredged aggregates occurs within the Moray Firth with a total of 14,294 tonnes of aggregates deposited in the Moray Firth in 2005 and a further 31,375 tonnes deposited near the entrance to the Firth. The disposal sites are, however, all located near the south coast of the Firth such that there are no designated dredge sites or spoil dumps in the vicinity of the

proposed development area. There is also a disposal site located near Wick on the north coast of the firth (DECC, 2009b) but this also is not in close proximity to the proposed development area.

5.3.5.2 Environmental Impacts Scoping

There are no disposal or dumping sites within the proposed development area therefore, **the potential for impacts on disposal sites is scoped out**.

There are no aggregate areas within the Moray Firth, therefore, **the potential for impacts on the aggregate industry are scoped out.**

5.3.6 Offshore Oil and Gas

5.3.6.1 Baseline Environment

Oil field development is the principal oil and gas activity within the Moray Firth.

The proposed cable element of the offshore transmission infrastructure that could be connected to the hub lies partly within two blocks in which Caithness Petroleum holds a provisional license (Table 5 -5).

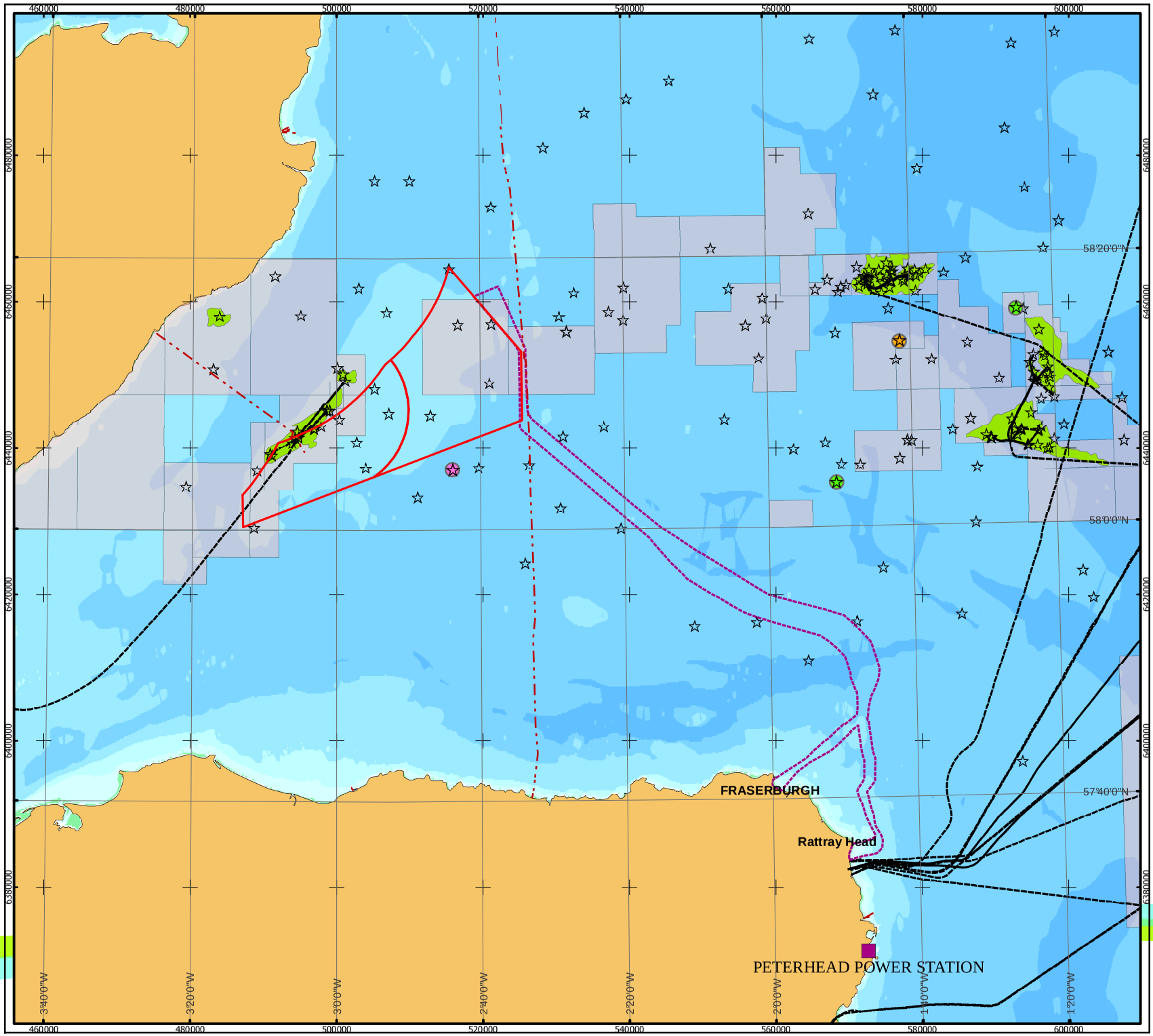
Table 5-5: Extant oil production licenses partially within the offshore export cable route study area.

License Name	Block/Quad	Operator	Licence Type	Expiry Date
P1701	12/22b	Caithness Petroleum	Production – promote	Provisional licence
P1723	12/23b	Caithness Petroleum	Production – traditional	Provisional licence

Applications for blocks within the 26th Seaward Licensing Round for oil and gas are were accepted as of 28th April 2010. These exploration licences were granted by the DECC on the 27th October 2010 (DECC, 2010); as a consequence, no additional licence blocks were awarded within the proposed development area. The DECC has decided to investigate the possibility of offering application for 45 further licences (comprising of 99 blocks) subject to further assessment (DECC, 2010), the progress of which will be analysed in relation to the proposed development route.

5.3.6.2 Data Gaps

Following the decision to grant the licence applications on the 26th seaward licensing round, there is sufficient information on oil assets within the Moray Firth. Additional information on future plans is anticipated to be obtained from consultation with relevant stakeholders.



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KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area
- Wells
- Pipelines
- Submarine Cables
- Oil
- Gas
- Gas condensate
- Current licence areas

Horizontal Scale: 1:700.000 A4 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

Produced: CR
Reviewed: RH
Approved: RH

Date: 18/06/2011 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-016

Fig:5-20 Overview of Oil & Gas Infrastructure and Subsea Cables & Pipelines

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5.3.6.3 Environmental Impacts Scoping

There is no infrastructure within proposed areas of interest for the offshore transmission infrastructure and access to the platforms is not routed through the development area. Therefore, **the potential for impacts on oil infrastructure is scoped out**.

5.3.6.4 Cumulative and In-combination Impact Assessment & Survey Methodologies

The methodologies and potential survey requirements by which cumulative and in-combination effects will be assessed will be agreed with consultees, nevertheless it is likely they will follow the principles outlined within the MFOWDG Cumulative and In-Combination Impacts Assessment Discussion Document (ERM, 2011a). In this report it is stated that cumulative impacts related to the scope of Oil and Gas in the area are concerned with the cumulative effect on the activity of helicopters and vessels. The impacts are largely considered under the Shipping and Navigation sections within the report.

5.3.7 Subsea cables and Pipelines

5.3.7.1 Baseline Environment

There is one existing cable in proximity to the proposed OFTO infrastructure. This is a telecommunications cable (SHEFA-2 Seg.9) which runs from the Orkney Islands to the Scottish coast at Inverboyndie, west of Fraserburgh (Kingfisher, 2008). The proposed OFTO Infrastructure will cross this cable.

Scottish Hydro Electric Tranmission Limited (SHETL) is obliged to develop a transmission connection for renewable energy projects on the Shetland Isles (e.g. Viking Wind Farm project). SHETL have proposed a High Voltage Direct Current (HVDC) connection between the converted station at Upper Kergord, Shetland and Blackhillock, Scotland, for which the subsea section would potentially cross the proposed OFTO infrastructure.

SHETL are also proposing an offshore HVDC Hub, which will support marine energy transmission from Shetland, the Pentland Firth area and Caithness to Peterhead. Current plans suggest that the location of the preferred hub will be approximately 1.3 km of MORL's Eastern development Area (see section 2.2.1 and Figure 2-5).

BOWL's offshore transmission infrastructure route is currently unknown. The Beatrice Transmission Works: Environmental Scoping Report (ERM, 2011b) describes a wide offshore study area, which includes MORL's development zone with a small buffer around the limits of the zone, following a slightly narrower corridor as it approaches the coast, continuing onshore as it reaches BOWL's National Grid connection point Blackhillock.

5.3.7.2 Environmental Impacts Scoping

There are no pipelines within or in proximity to the proposed infrastructure. Therefore, the impacts on pipelines are **scoped out**.

Based on available literature, the following are perceived to be the potential impacts on cables as a result of wind farms within the marine environment:

Impact Description	Potential site specific impact	Potential cumulative and/or in-combination Impact
Impacts on safety (associated with export cable location and associated construction/operation works within works restriction zone)	✓	x

5.3.7.3 SITE SPECIFIC IMPACT METHODOLOGY

Potential Impact(s)	Impact on navigational safety (associated with works restriction zone)
Survey/Study Proposed to Assess Impact	To determine the potential for impacts to safety, the following study will be undertaken: Navigational risk assessment (section 5.3.3)
Method of Impact Assessment	A navigational risk assessment will assess the risk associated with collision with the offshore substation infrastructure.

5.3.7.4 SITE SPECIFIC SURVEY METHODOLOGY - SUMMARY

CONSULTATION

With the exception to impacts to safety, information gathered through consultation will be the main technique used to guide the requirements for potential impact assessment studies and possible mitigation requirements. The main aim of the consultation will be to agree cable crossing and proximity agreements where necessary.

NAVIGATIONAL RISK ASSESSMENT

Navigation risk assessments are described in section 5.3.3.

5.3.7.5 POTENTIAL MITIGATION MEASURES

The mitigation measures proposed for the final OFTO infrastructure will be dependent upon the final design and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.3.8 SEASCAPE, LANDSCAPE AND VISUAL RECEPTORS

Seascape is defined as *"the coastal landscape and adjoining areas of open water, including views from land to sea, from sea to land and along the coastline"* (DTI, 2005b). The impact upon seascape, landscape and visual resources is dependent upon a range of interacting factors, including, among others: the Zone of Theoretical Visibility (ZTV); the visual sensitivity of the area; the sensitivity of the landscape and seascape; meteorological conditions; the design and layout of the development; and,

the location of the development. The OFTO development includes both offshore and onshore elements and may give rise to seascape, landscape and visual effects. The completion of a seascape, landscape and visual assessment allows the significance of effects of the development on the landscape, seascape and visual resources to be assessed, with reference to established methodology and guidance.

The seascape, landscape and visual impact assessment (SLVIA) will assess the potential effects of the OFTO infrastructure, consisting offshore substation platforms (3 – 6 HVAC and 2 HVDC), offshore to onshore cables, cable landfall, onshore export cables and onshore substation on seascape, landscape and visual receptors in a defined study area.

5.3.8.1 BASELINE ENVIRONMENT

The offshore transmission infrastructure consists of both offshore and onshore elements (substations and export cables), therefore the baseline environment consists of seascape, landscape and visual receptors. Seascape receptors are relevant for the offshore elements of the Development; landscape receptors for the onshore elements. Visual receptors are relevant for both offshore and onshore elements.

STUDY AREA

The proposed study area for the SLVIA of the OFTO infrastructure is illustrated in Figure 2-5. It includes coastal areas of Caithness between Duncansby Head and Helmsdale; coastal areas of Moray between Lossiemouth and Cullen; and coastal areas of Aberdeenshire between Portsoy and the southern side of Peterhead. The study area covers locations which may have visibility of both offshore and onshore OFTO infrastructure, and the offshore wind turbines. The onshore infrastructure (cable landfall, onshore export cables and onshore substations) will only be assessed for the Moray and Aberdeenshire sections of the study area, as the onshore infrastructure will not be visible from the Caithness coast.

SEASCAPE CHARACTER

A strategic seascape assessment for offshore wind development has been completed for Scotland, which is based upon regional seascape units (Scott *et al*., 2005). The assessment investigated the potential impact on seascape as capacity for development, which is derived from an assessment of the visibility of wind farms and the sensitivity and value of the seascapes. The study provides the basis for a seascape classification for Scotland at the national level. The regional seascape units of relevance to the proposed wind farm are:

- Area 5: North Aberdeenshire/Morayshire Coast;
- Area 6: Moray Firth; and
- Area 7: East Caithness & Sutherland

The seascape types that are found within these seascape units/areas are:

- Type 1: Remote High Cliffs;
- Type 2: Rocky coastline / open sea views;
- Type 3: Depression coastline / open views;
- Type 4: Outer firths;
  Subtype 4a: Smaller & less developed outer firths;
- Type 5: Developed inner firths;
- Type 6: Narrow coastal shelf.
- Type 11: Less developed inner firths.

The Scottish seascape study (Scott *et al*., 2005) determined a strategic scale of national Seascape Units and Seascape Character Types. It suggests that a regional scale seascape character assessment is an appropriate level of detail for offshore wind development. The definition of these regional scale Seascape character units and their sensitivity to the proposals will be an essential part of the assessment process. The methodology for undertaking this baseline seascape assessment will be based on published guidance, particularly the GSA, 2005 DTI Seascape Impact report and the emerging Seascape Character Assessment guidance, soon to be published in draft form, by SNH/Natural England. Seascape character units/types will be defined along the Caithness and Moray coasts, to form the relevant baseline for all offshore components of the Development including wind turbines, offshore substations and cables.

LANDSCAPE CHARACTER

The onshore elements of the offshore transmission infrastructure are located within Aberdeenshire, in Banff and Buchan. Scottish Natural Heritage Review No 37 (Banff and Buchan) identifies the landfall points of the onshore cable routes (Rattray and Fraserburgh Beach) as being located in *The Coast* landscape character area, within the *Dunes and Beaches from Fraserburgh to Peterhead* landscape unit. This landscape unit is a coastal landscape with wide expanses of sand and dunes, which form a contrast to the high headlands and cliffs of the coastline elsewhere. The remainder of the onshore cable routes (Rattray and Fraserburgh) and the onshore substation are located in *The Coastal Farmland* landscape character area, within the *Eastern Coastal Agricultural Plain* landscape unit. This landscape unit sweeps around the eastern coast of Banff and Buchan is formed from a variety of landscapes, with the proximity and influence of the sea and the extent agricultural cultivation being common elements in determining its landscape character. The potential effect of the onshore OFTO developments on these landscape units will be considered in the assessment.

Two relevant landscape-related planning designations are found in the study area; Gardens and Designed Landscapes (GDL) and Areas of Landscape Significance (ALS). Within the Aberdeenshire Local Plan (Adopted 2006) a local policy exists for valued landscapes, referred to as Areas of Landscape Significance (ALS). The nearest ALS to the onshore OFTO developments set out in the Local Plan is designated around Fraserburgh Bay, covering part of the landscape at the cable landfall location for the Fraserburgh cable route option. There are no GDLs located near to the onshore cable routes or the onshore substation; the closest being Haddo House located 18 km to the south west (see section 5.3.9 Archaeology and Cultural Heritage). The potential effect of the onshore OFTO developments on designated areas will be considered in the assessment.

VISUAL RESOURCE

There are a number of settlements within the study area, ranging from the larger towns of Peterhead and Fraserburgh, other towns such as Wick, Banff, Buckie and Lossiemouth, to small villages and scattered rural properties. These settlements are linked by a network of roads, including the main routes of the A90, A98, A9 and A99. The onshore substation is located close to the settlement of Peterhead and the A90. Railways have a very limited presence in the study area, with just a short section of the Inverness to Wick line making a incursion into the Caithness part of the study area on its approach to Wick.

National Cycle Route 1 (which is also part of the North Sea Cycle Route) runs through the study area, passing through the west part of Banff and Buchan, and the northern part of Caithness. There are no officially recognised Long Distance Routes (walking routes) in the study area, although there are several regional footpath routes used by walkers, as well as cyclists. There are a number of tourist and other visitor attractions in the study area, including several of the properties that constitute Gardens and Designed Landscapes, historic landscape features, including a number of castles and lighthouses, beaches and country parks. The effect of the offshore and onshore OFTO developments on all of these potential visual receptors will be assessed fully in the SLVIA.

5.3.8.2 DATA GAPS

A study to determine cumulative and in-combination viewpoints will be required. Site visits to viewpoints and the production of site specific ZTVs will also be required.

5.3.8.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature and understanding of the study area, the following are perceived to be the potential impacts on the seascape, landscape and visual environments as a result of the onshore and offshore OFTO developments:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination impact**
Change in seascape character	✓	✓
Change in landscape character	✓	✓
Change in visual resource	✓	✓

5.3.8.4 SITE SPECIFIC IMPACT METHODOLOGY

For each of the potential impacts described above, a survey or study and method of impact assessment is described in the tables below.

Potential Impact(s)	**Change in seascape character during construction, operation and decommissioning of the offshore OFTO developments:** **Direct and indirect effects on seascape character units; and** **Direct and indirect effects on designated seascapes.**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on landscape character, the following studies will be undertaken: Desk-based study using a ZTV; and Field work to confirm desk-based study, delineate and describe regional seascape units/areas.
Method of Impact Assessment	The SLVIA will be undertaken with due regard to best practice guidance set out in: Countryside Council for Wales: Guide to Best Practice in Seascape Assessment (2001); Landscape Institute and Institute of Environmental Management and Assessment Guidelines for Landscape and Visual Impact Assessment': Second Edition (2002); Department of Trade and Industry, Guidance on the Assessment of Impact of Offshore Wind Farms: Seascape and Visual Impact Report (November 2005); and SNH, Natural England: Seascape Character Assessment Guidance (Unpublished report).

Potential Impact(s)	**Change in landscape character during construction, operation and decommissioning of the onshore OFTO developments:** **Direct effects on landscape character types/units.** **Indirect effects on landscape character types/units.** **Direct and indirect effects on designated landscapes.**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on landscape character, the following studies will be undertaken: Desk-based study using a ZTV. Field work to confirm desk-based study, delineate and describe landscape character types/units.
Method of Impact Assessment	The LVIA will be undertaken with due regard to best practice guidance set out in: SNH, Countryside Agency: Landscape Character Assessment Guidance for England and Scotland (2002) Landscape Institute and Institute of Environmental Management and Assessment Guidelines for Landscape and Visual Impact Assessment': Second Edition (2002).

Potential Impact(s)	**Change in visual resource during construction, operation and decommissioning of the offshore and onshore OFTO developments:** **Direct and indirect effects on visual receptors, including:** **Views from residential areas;** **Views from transport routes, roads, railways, ferries;** **Views from designated landscapes;** **Views from publicly accessible historic environment features;** **Views from recreational routes, footpaths and cycleways;**

	Views from other publicly accessible land; and Potential marine based views.
Survey/Study Proposed to Assess Impact	To determine the potential for effects on visual resources, the following studies will be undertaken: Desk-based study using a ZTV; Consultation with consultees to reach agreement on viewpoints; Assessment of meteorological data for visibility; Assessment of sea use/users; and Field survey to confirm desk-based study, describe and assess viewpoints.
Method of Impact Assessment	The SVIA will be undertaken with due regard to best practice guidance set out in: Department of Trade and Industry, Guidance on the Assessment of Impact of Offshore Wind Farms: Seascape and Visual Impact Report (November 2005); Horner and MacLennan and Envision, Visual Representation of Windfarms: Good Practice Guidance (2006), for Scottish Natural Heritage, The Scottish Renewables Forum and the Scottish Society of Directors of Planning; and, Landscape Institute and Institute of Environmental Management and Assessment Guidelines for Landscape and Visual Impact Assessment': Second Edition (2002).

5.3.8.5 SITE SPECIFIC SURVEY METHODOLOGY

OPEN has developed a methodology for SLVIA which accords with the Guidelines for the Assessment of Landscape and Visual Effects: Second Edition, 2002. This methodology has drawn on the considerable experience gained in this field of work.

A baseline desk study will be undertaken to review the existing seascape, landscape and visual resource of the study area and forms the basis against which to evaluate the sensitivity of the study area to the OFTO developments. The main elements of the baseline desk study will include a review of baseline information, seascape characterisation and baseline visual analysis.

The desk study will review existing mapping and written information sources, including admiralty charts, Ordnance Survey (OS) maps, aerial photography, existing landscape and seascape assessments, capacity studies, inventories of designed landscapes, development plans and met office weather data. Other surveys will also be relevant when defining the seascape, landscape and visual baseline, including activity surveys, tourist information, ferry route information, historic and cultural guides, cultural heritage, conservation interests and recreational route maps.

The study area for the OFTO developments is shown in Figure 2-5. Seascape characterisation and visual analysis will provide a robust baseline from which to assess the sensitivity and capacity of the study area to the OFTO developments. The seascape, landscape and visual assessment will be carried out through desk study, field survey and analysis.

A baseline seascape, landscape and visual characterisation will be undertaken to defining the seascape units and landscape types of potential significance in the study area, based on published seascape and landscape character assessment methodologies. In tandem with this seascape and landscape characterisation, the visual resource of the study area will be defined and sensitive

receptors identified, through analysis of activities, visibility and views in the study area, and with reference to published guidance on visual assessment. Representative viewpoints will be identified from which to predict and assess the effects of the onshore and offshore OFTO developments.

Following the completion of the seascape characterisation and baseline visual analysis, the sensitivity of the seascape, landscape and visual resource to change of the nature proposed will be assessed and this will form the basis for the assessment. The sensitivity of the seascape and visual resource will be evaluated and defined in terms of the interactions between the landscape and views, the way it is perceived and valued, and the particular nature of the type of change associated with the Development. The determination of the sensitivity of the seascape and visual resource will be based on an assessment of key elements and characteristics, using defined criteria, to arrive at an overall sensitivity for each seascape/landscape unit and visual receptor/viewpoint.

The magnitude of change to both the identified seascape/landscape units and visual receptors (such as viewpoints, settlements, routes and visitor attractions) will be assessed in a transparent manner. The magnitude of change arising from the Development will be described based on the interpretation of a combination of factors, such as the distance from the Development, the amount of the Development visible, the proportion of view occupied, the position and relationship of the Development to other focal points, the duration of effect - whether temporary or permanent, intermittent or continuous, frequent or infrequent, and the number and extent of resources affected.

The SLVIA will include the residual effects during construction, operation and decommissioning on landscape elements, seascape character and visual receptors. An assessment of the significance of effects will be carried out based on the combination of the sensitivity to change of a given receptor and the magnitude of change upon it resulting from the developments. The assessment will include assessment and reporting of effects on landscape fabric (physical effects), assessment of effects on landscape and seascape character and assessment of effects on visual resources.

When predicting the potential seascape, landscape and visual impacts, the extent of potential visibility of the onshore substation will be shown using a Zone of Theoretical Visual influence (ZTV). A visibility assessment of the onshore substation will be carried out using the ZTV to describe the general extent and pattern of visibility of the Development within the study area. The visibility assessment will also describe the extent of visibility from the main activities in the study area, such as recreational activities, settlements and the main road, rail and footpath network.

Viewpoint photography, wirelines and photomontages will be prepared and presented in accordance with current best practice techniques. A total of six viewpoint locations will be included in the assessment which would be specific to the onshore substation location. The viewpoint locations will be defined upon confirmation on the location of the onshore substation,. These viewpoints will then be proposed/ discussed with relevant stakeholders.

A total of three viewpoints will also be included in the assessment which would be specific to the offshore substations and cables, and the cable landfall. The location of the landfall, the offshore cable route and offshore substations will be indicated, together with the offshore wind turbines, to illustrate the relationships between the potential locations of the cable laying vessels, offshore substations and the offshore wind turbines.

Photographs will show the existing view from these locations and a computer visualisation/wireline view of the development proposals will be produced for each viewpoint. Rendered photomontages of the onshore substation will also be produced from the two of the proposed viewpoints. Plan graphics will illustrate the OFTO development proposals in relation to the seascape, landscape and visual receptors on OS mapping or aerial photography.

5.3.8.6 SUMMARY OF METHODOLOGY

IDENTIFICATION OF POTENTIAL EFFECTS AND PROPOSED ASSESSMENT METHODOLOGY
Using industry guidance contained within the relevant documents referred to below, the SVIA will undertake the following:

- A scoping exercise and consultation with statutory and non-statutory consultees to establish valued regional and local landscape and seascape resources and viewpoints;
- Baseline studies of existing landscape, seascape and visual environment incorporating national level conclusions;
- Assess the sensitivity of those resources and receptors to the proposals;
- Provide advice on any mitigation that may be possible, e.g. layout, and incorporate agreed mitigation into the scheme description;
- Propose and agree monitoring;
- Identify the potential effects of the proposal on the landscape, seascape and visual environment during the construction, operation and decommissioning phases of the project and assess the significance of these effects.
- A cumulative assessment on the combined effects of the proposed development in combination with any other major developments that lie within the agreed study area. A list of such developments would be agreed with the relevant authorities; and
- Present the finding in the Environmental Statement (ES) and Non-technical Summary (NTS).

5.3.8.7 CUMULATIVE AND IN COMBINATION IMPACT ASSESSMENT

Cumulative seascape, landscape and visual impact assessment (CSLVIA) will be undertaken to take account of the OFTO works and the Moray Offshore wind turbines as well as other agreed developments. In particular, this will include the Beatrice Offshore Wind Farm proposal, Beatrice demonstrator project and other operational, consented and application stage onshore wind farms with which the OFTO developments may combine to create additional cumulative effects. The cumulative effect of the OFTO developments will also be assessed in combination with other types of relevant development, including, for example, existing substations and power stations. The methodologies and potential survey requirements by which cumulative and in-combination effects will be assessed will be agreed with consultees as part of ongoing consultation with stakeholders and the MFOWDG.

5.3.8.8 POTENTIAL MITIGATION METHODS

Alongside the assessment, options for mitigation of the identified potential effects which are predicted to arise from the OFTO Developments will be considered, and practical measures agreed to avoid, reduce or off-set these effects. The SLVIA will identify measures for avoiding or reducing the level of significance of potential effects. These measures will potentially include:

- measures embedded into the design;
- measures additional to these which would further reduce long term seascape, landscape and visual impacts (such as recommendations for potential landscape or habitat enhancement measures); and
- measures which would reduce landscape and visual effects due to construction, including details of restoration measures.

Potential embedded mitigation measures for effects on seascape, landscape and visual effects include the site selection for OFTO developments, e.g. locating at distance from the coast and the realisation of design objectives for the development, achieved through alterations to layout, design and siting of OFTO facilities. Landscape and visual input into the site design is likely to be important for the onshore substation(s), where there may be opportunities to consider landscape mitigation measures to improve the integration of the development with the landscape and create beneficial effects in the long term, such as new planting, habitat creation etc. The OFTO development proposals will be modelled, represented and interrogated using 3D visualisation software, to assist with the siting, layout and design of the development proposals.

The mitigation measures proposed for the development area will be dependent upon the final design of the site and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.3.9 ARCHAEOLOGY AND CULTURAL HERITAGE

The archaeological and cultural heritage features that will require consideration for the offshore transmission infrastructure will be located within the marine environment (around the offshore substation area and offshore export cable) and terrestrial environment (along the onshore export cable and around the onshore substation).

It is acknowledged that the seas around Britain contain many archaeological sites and remains. Such sites reflect the changing nature of both the coastline around Britain and the activities of the country throughout previous centuries, and broadly include:

- Submerged prehistoric landscapes formed when parts of the UK seas were still dry land;
- Remains and sites, including but not limited to shipwrecks, evidence of Britain's early history; and
- More recent sites, reflecting Britain's role as a major naval, mercantile, industrial and imperial power.

Cultural heritage and archaeological assets within the marine environment are located both on and below the seabed. Cultural heritage and archaeological remains that are afforded protection include wrecks and wreckage of historical, archaeological or artistic importance designated as protected or dangerous under the Protection of Wrecks Act (1973) (soon to be replaced in Scottish waters by Marine Protected Areas (MPAs) under the Marine (Scotland) Act 2010); military remains designated as 'protected places' or 'controlled sites' under the Protection of Military Remains Act (1986); and Scheduled Monuments designated under the Ancient Monuments and Archaeology Act (1979) (through the Historic Environment (Amendment Scotland) Bill in Scotland). It is an offence to cause

damage to protected archaeological remains and in some cases where a restricted zone exists around the remains, a licence is required before any intrusive works can be undertaken. Restricted zones can vary in size depending on the extent of any associated remains and the degree of sensitivity of a site. Obstructions and foul ground areas also have the potential to represent cultural heritage assets but are not classified as such until the character of such anomalies have been confirmed. The Merchant Shipping Act 1995 also requires that any material classified as 'wreck' recovered from the seabed during the course of a development is reported as a legal requirement to the Receiver of Wreck.

In addition to cultural heritage assets that are afforded protection, the seas around Scotland also contain a large number of assets that are currently unprotected or that are yet to be discovered.

Within the terrestrial environment the cultural heritage assets can be located on and below the ground surface. The historic environment encompasses archaeological features, historic buildings, historic landscape features, battlefields and palaeoenvironmentally significant deposits. The main legislation, guidance and policy that will require consideration for the EIA are the Ancient Monuments and Archaeology Areas Act, 1979 and the Scottish Planning Policy. The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 is unlikely to have great relevance

There is a wide range of designations relating to terrestrial heritage assets. These comprise:

- **World Heritage Sites –** defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) as places of 'outstanding universal value', selected for their important cultural or natural features.
- **Scheduled Ancient Monuments (SAM) –** monuments of national importance that Scottish Ministers have given legal protection under the Ancient Monuments and Archaeological Areas Act 1979.
- **Listed buildings (LB) –** structures of special architectural or historic interest assigned by Historic Scotland to one of three categories (A, B or C) according to their relative importance.
- **Conservation Areas –** areas of special architectural or historic interest which character or appearance are desirable to preserve or enhance.
- **Properties in Care –** properties which are managed by Historic Scotland on behalf of others, including Scottish Ministers.
- **Gardens and Designated Landscapes (GDL**) – gardens and landscapes considered by Historic Scotland as nationally as valuable assets at national, regional and local level.
- **Registered Battlefields –** battlefields that are considered to be of national importance satisfying the criteria provided in the *Scottish Historic Environment Policy*.

Most heritage assets are, however, undesignated and many are currently unrecorded.

5.3.9.1 BASELINE ENVIRONMENT

OFFSHORE ENVIRONMENT

A total of 375 marine cultural heritage assets have been identified along the Moray Firth coastline from previous surveys commissioned by Historic Scotland; most of which represent intertidal sites (Talisman, 2005). In addition to cultural heritage assets within the Moray Firth, there are many

recorded maritime losses in the area. The strategic importance of the Moray Firth area in the recent past; the concentration of much of the North Sea fishing fleet in coastal ports along the north east coast of Scotland; the importance of maritime trade routes in the area; and the treacherous nature of near shore waters is likely to account for these losses.

There are 13 charted wrecks along the offshore export cable route study area (Figure 5-21). While these assets are not currently afforded statutory protection it is noted that sites found to exhibit national or international significance can be classified within the lifetime of a project.

There are five 'dangerous wrecks' within the shallow waters near Fraserburgh and Rattray. Three of these wrecks are within the offshore export cable study area; two are relatively recent wrecks associated with fishing vessels (Fraserburgh landfall) and the third is the drifter 'Victory' sank in 1923 which is approximately 2.2 km from Rattray Head and on the north boundary of the export cable route associated with the Rattray landfall point option (Figure 5-22). This is a protected wreck and has an exclusion zone of 750 m radius. Within protected sites, it is an offence to tamper with, damage, move or unearth any remains, enter any hatch or opening or conduct diving, salvage or excavation operations for the purposes of investigating or recording the remains, unless authorised by licence.

Fleming (2004) stated that it was difficult to predict the potential for pre-historic remains within the central North Sea, but there was a low probability of finding *in situ* remains in the offshore environment because of the strong currents, exposure to North Atlantic storms, thin sediment cover and large areas of exposed bedrock in this area. The probability of finding remains within the region was greater in more sheltered coastal areas. However, there has not been a detailed study of the proposed development area.

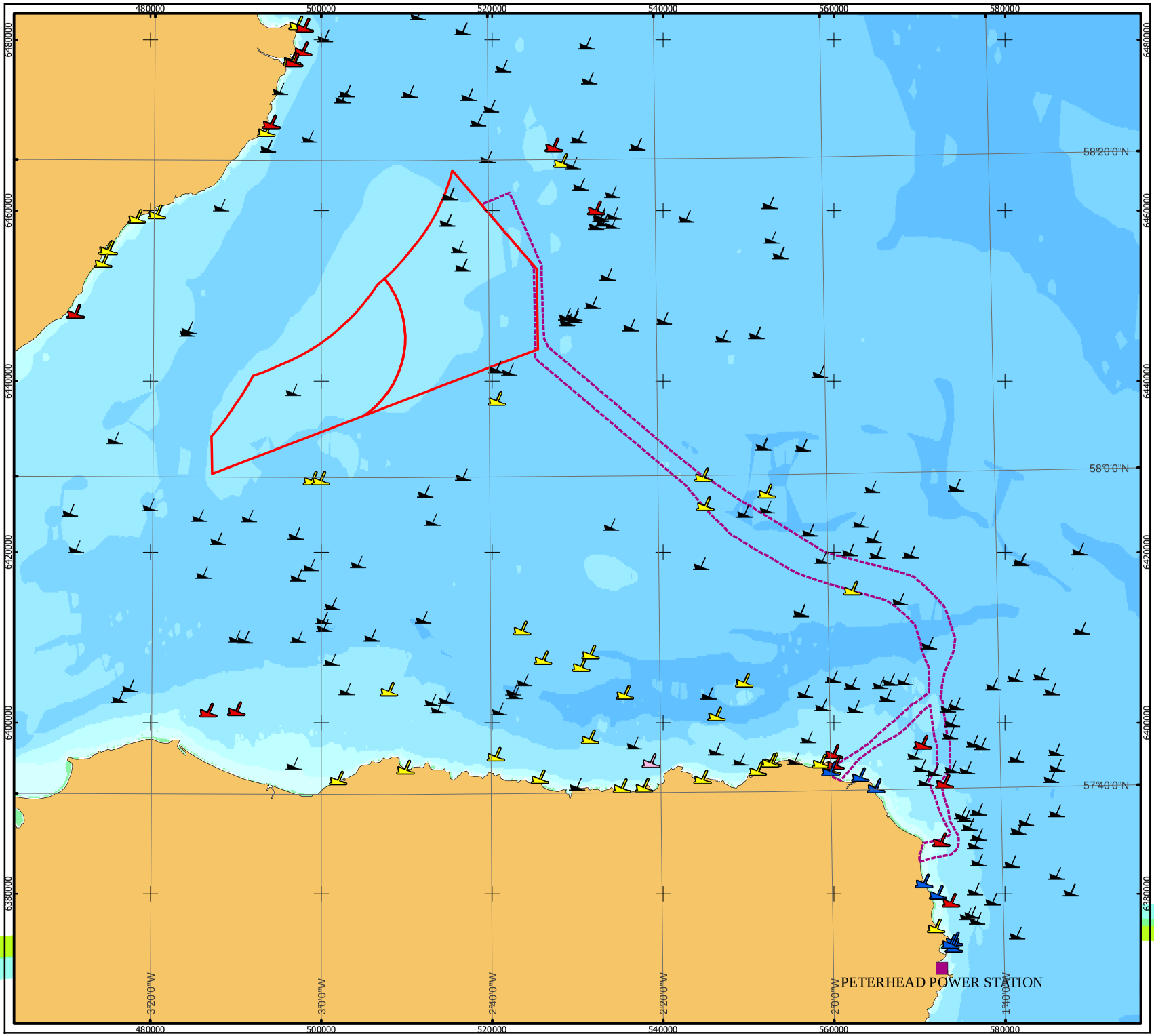
ONSHORE ENVIRONMENT

The number of features of archaeological interest varies greatly within the terrestrial environment. In Aberdeenshire there are no World Heritage Sites, and the GDLs are located at over 20 km to the west and south of the onshore export cable corridors under consideration (the nearest is Craigston Castle at approximately 23 km west).

There are several LB within Aberdeenshire, but only a small number are located within onshore export cable study area. Of interest is the St Medan's Church and Philorth Churchyard (category B) located in close proximity of the proposed landfall point at Fraserburgh. The SAMs are also scattered within the northeast Aberdeenshire area, but mainly along the Rattray coastline (pill boxes associated with the WWII defences). There are only a small number of conservation areas and properties in care within the area, none of which are in close proximity of the study routes. Designated heritage assets in the northeast Aberdeenshire area are shown in Figure 5-22.

The route corridors cross good agricultural land there is inevitably therefore a large number of previously recorded assets within the corridors, many of which are known only from aerial reconnaissance. The baseline condition and, in many cases, date of such features is uncertain. The recorded assets present include prehistoric burials and enclosures, shell middens and later features, including farmsteads, rig and furrow, brick factories and canals. Reflecting the intensive agricultural

usage of most of this area of Aberdeenshire the majority of sites have no surface expression; upstanding remains having been removed by successive phases of agricultural improvement.



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- Moray Offshore Wind Farm Boundary
- OFTO Offshore Study Area

WRECKS

- Dangerous wreck
- Distributed remains of wreck
- Non-dangerous wreck
- Wreck showing any portion of hull or superstructure
- Unclassified wreck

Horizontal Scale: 1:600.000 A3 Chart

0 10.000 20.000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

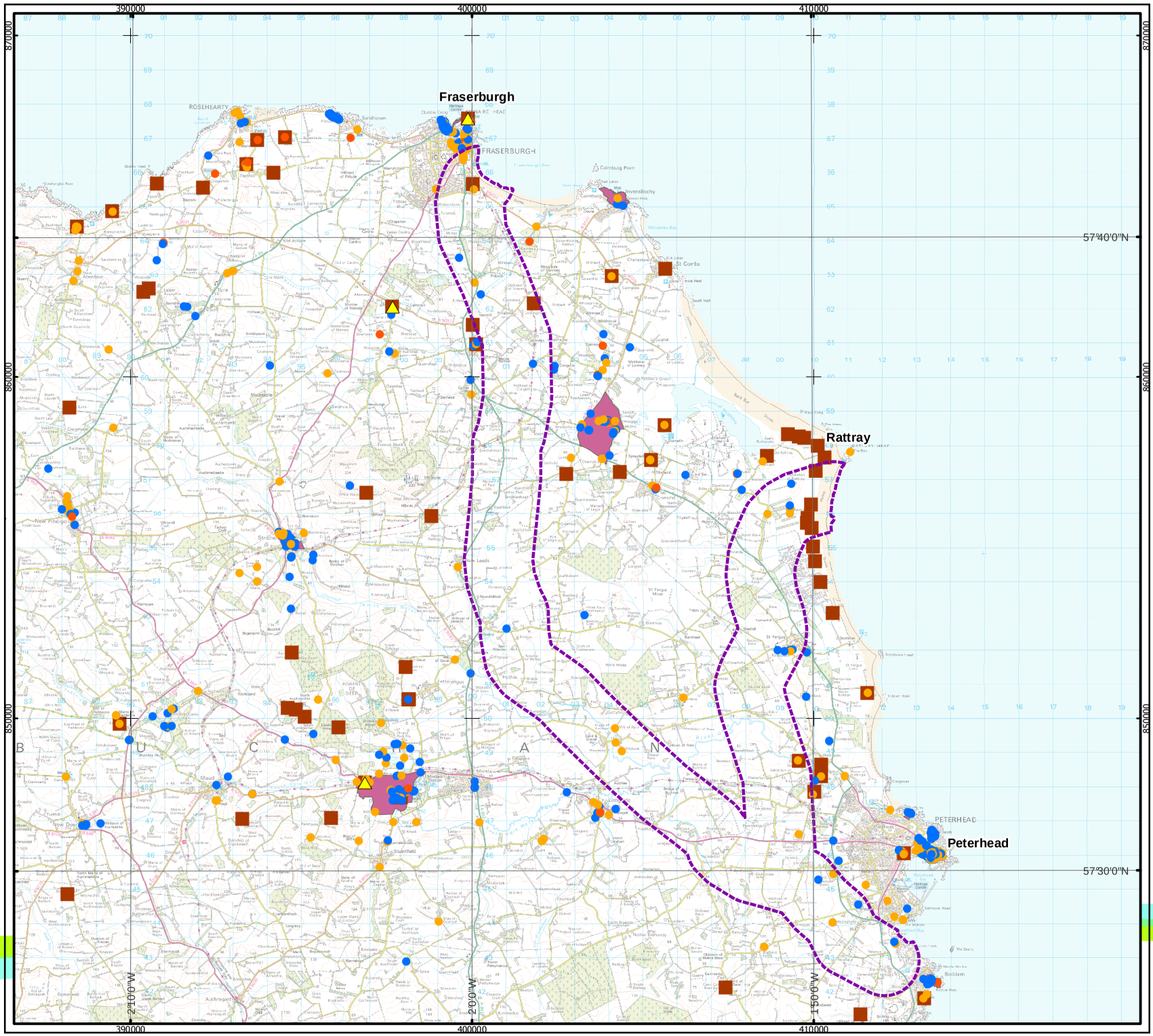
Produced: CR
Reviewed: RH
Approved: RH

Date: 15/06/2011 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-018

Fig:5-21 Recorded Wrecks & Recreational Sailing Routes

Moray Offshore Renewables Ltd



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REPSOL

Moray Offshore Renewables Ltd

KEY

- OFTO Onshore Study Area
- Properties in care

Listed Buildings

- Category A
- Category B
- Category C
- Sheduled ancient monuments
- Conservation areas

Horizontal Scale: 1:150.000 A4 Chart

0 2.500 5.000 Meters

N

Geodetic Parameters: Brittish National Grid (OSGB36)

Produced: CR
Reviewed: RH
Approved: RH

Date: 15/06/2011 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-019

Fig:5-22 Designated Heritage Assets within NE Aberdeenshire

Moray Offshore Renewables Ltd

5.3.9.2 DATA GAPS

There is a lack of site specific survey data and it is therefore anticipated that such data will be required for the impact assessment process. Knowledge of archaeological assets is inevitably partial , not all archaeological features will produce cropmarks as this is dependent on feature type, geology and agricultural regime. In addition, the baseline condition of archaeological assets within the corridor is largely unknown – assets recorded as cropmarks are generally subject to ongoing plough truncation and hence are being actively destroyed.

5.3.9.3 ENVIRONMENTAL IMPACTS SCOPING

Based on available literature, the following are perceived to be the potential impacts on the archaeology and cultural heritage as a result of wind farms within the marine environment:

OFFSHORE ENVIRONMENT

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Contamination, damage or loss of archaeological remains in or on the seabed	✓	x
De-stabilisation of sites through changed sedimentary regimes	✓	x

Cable laying would seek to avoid any features of historical interest on the seabed and it is expected that any accidental disturbance of features will be afforded the appropriate response through established archaeological protocols and procedures for unexpected archaeological discoveries. During operation impacts will be limited to potential indirect impacts associated with altered patterns of seabed sediment erosion and accretion. Therefore, the potential for cumulative and in-combination impacts on archaeology and cultural heritage are **scoped out**.

ONSHORE ENVIRONMENT

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Damage or loss of features of onshore archaeological interest	✓	x
Potential impacts upon setting resulting from substation	✓	x

There are a number of features of archaeological interest located across the study area; with only a small number within the wider study area corridor(s). The activities associated with cable laying and

construction of the onshore substation would seek to avoid any features of historical interest and it is expected that the chance of accidental disturbance of features will be minimal. During operation impacts will be limited to potential indirect effects associated with maintenance of the export cable and potentially impacts upon setting resulting from the presence of the substation in the landscape. None of these have the potential to result in significant cumulative or in combination impacts. Therefore, the potential for cumulative and in-combination impacts on archaeology and cultural heritage are **scoped out**.

5.3.9.4 SITE SPECIFIC IMPACT METHODOLOGY

For each of the potential impacts described above a survey or study and method of impact assessment is described in the tables below.

OFFSHORE ENVIRONMENT

Potential Impact(s)	**Contamination, damage or loss of archaeological remains in or on the seabed**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on existing archaeological remains, the following studies will be undertaken: Assessment of archaeological potential and significance Geophysical and Geotechnical survey (see section 5.1.2.2)
Method of Impact Assessment	The assessment of archaeological potential and significance will be used to identify the potential archaeological remains within the area and their importance. The potential for impact upon these features will be assessed using a risk assessment of the direct impacts of substation/export cable location and construction methods.

Potential Impact(s)	**Destabilisation of sites through changed sedimentary processes**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on existing archaeological remains, the following studies will be undertaken: Assessment of archaeological potential and significance Geophysical and Geotechnical survey (see section 5.1.2.2) Metocean studies (see section 5.1.2.2)
Method of Impact Assessment	The assessment of archaeological potential and significance will be used to identify the potential archaeological remains within the area and their importance. The potential for impact upon these features will be assessed in relation to the results of the potential for changes in the sediment transport regime (e.g. the potential to cause burial or exposure of features).

ONSHORE ENVIRONMENT

Potential Impact(s)	**Damage or loss of features of onshore archaeological interest**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on features of onshore archaeological interest, the following studies will be undertaken: Desk study to map features of archaeological and cultural interest within study area and wider context (designated by Historic Scotland and Aberdeenshire

	Council) Field work to confirm desk-based study results and to identify additional features of archaeological importance Fieldwork to establish baseline setting of assets in the vicinity of the substation
Method of Impact Assessment	The assessment of archaeological potential and significance will be used to identify the potential archaeological remains within the area and their importance. There are no 'standard criteria' for determining the significance of potential effects on archaeological features. The significance will therefore be determined using criteria developed from best practice techniques and expert knowledge in accordance to relevant legislation and guidance.

5.3.9.5 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

The scope will follow the non-statutory *Code of Practice for Seabed Developers* produced by the Joint Nautical Archaeology Policy Committee, and, where applicable, following the following guidance and legislation:

- Article 303 of the United Nations Convention on the Law of the Sea (UNCLOS)
- Article 2.ii. The European Convention on the Protection of the Archaeological Heritage (revised) (The Valetta Convention)
- Planning Advice Note 42 "Advice on the handling of archaeological matters within the planning process"
- Scottish Planning Policy 23 "Planning and the Historic Environment"
- Protection of Wrecks Act 1973
- The Ancient Monuments and Archaeological Areas Act 1979
- Protection of Military Remains Act 1986
- The Merchant Shipping Act 1995
- Historic Scotland Archaeological Procedure, Paper 4, 1996
- BMAPA & English Heritage (2003). Marine Aggregate Dredging and the Historic Environment: Guidance Note
- Wessex Archaeology Ltd (2007). Historic environment guidance for the offshore renewable energy
- The Crown Estate (2010). Offshore Renewables Protocol for Archaeological Discoveries; and
- The Crown Estate (2010). Round 3 Offshore Renewables Projects Model Clauses for Archaeological Written Schemes of Investigation.

5.3.9.6 SUMMARY OF METHODOLOGY

ARCHAEOLOGICAL POTENTIAL AND SIGNIFICANCE

The offshore and onshore assessments would include collation of existing documentary evidence from a variety of sources in order to predict the likely character and extent of archaeological remains along the export cable route (onshore and offshore) and substation (offshore and onshore).

The desk-study would be supplemented by assessments of field data collected (offshore: geophysical survey, benthic and geotechnical campaigns; onshore: site visits). For the offshore assessment for instance, review of swathe bathymetry, side-scan sonar and sub-bottom profiling can be used to identify features of cultural heritage potential, such as wreck remains and associated debris and submerged features of palaeoenvironmnetal and archaeological interest. The analysis of grab also allows an assessment of the potential for submerged landscapes through sedimentary facies and associated human activity.

It should be noted that if any offshore wreck material is recovered, the developer will inform the Receiver of Wreck under Section 236 of The Merchant Shipping Act 1995, and await further instruction.

OTHER SURVEYS/STUDIES TO BE USED TO IDENTIFY IMPACTS

Geophysical, geotechnical and metocean surveys are described in section 5.1.2.2.

Onshore site visits to confirm results of desk based study and identification of any additional targets of archaeological interest.

5.3.9.7 POTENTIAL MITIGATION METHODS

Potential mitigation measures for impacts to archaeology and cultural heritage include micrositing of substations and export cable routes (offshore and onshore), choice of construction techniques and the use of a written scheme of investigation and protocol and procedures for unexpected archaeological discoveries.

The mitigation measures proposed for the development area will be dependent upon the final design of the site and the potential impacts as determined by the EIA studies. In regard to physical impacts, these will be avoided through design as far as is reasonably practicable. Where this is not possible provision will be made for the preservation of assets by record. Setting impacts will be prevented or reduced through design, in particular landscaping of the substation. Mitigation options will be discussed with the relevant authorities prior to ES submission.

5.3.10 SOCIO-ECONOMICS, RECREATION AND TOURISM

The following description of the baseline environment has been established through a desk based review of the following information:

- CNSRP (2010). http://www.cnsrp.org/. Accessed 2010.
- The Highland Council (2010). http://www.highland.gov.uk/. Accessed 2010.
- Aberdeenshire Council (2008). Banff and Buchan Profile. Available from http://www.aberdeenshire.gov.uk/statistics/area/index.asp.
- Scottish Government (2010). http://www.scotland.gov.uk/About/scotPerforms/indicators/electricity.
- Visit Scotland (2011). http://www.visitscotland.com/. Accessed 2011.

5.3.10.1 BASELINE ENVIRONMENT

In terms of socio-economic data, the closest published profile relates to the "Inner Moray Firth", this is an area that includes Inverness and has a population of 144,000 which has been growing. Other main population centres on the coastline include Wick, Helmsdale, Brora, Golspie, Dornoch, Tain, Fortrose, Avoich, Inverness, Nairn, and Lossiemouth. For some of MORLs proposed analysis (tourism and recreation) this is probably too wide a geographical area, but may be more relevant for labour markets. Employment is greatest in public administration, education and health accounting for over 30% of all employees in 2008. Manufacturing and construction are also relatively large employment sectors comprising of approximately 15% of the workforce. Unemployment in the Inner Moray Firth has tended to be lower than the Scottish average but has, however, risen since 2008, with 0.9% of the working age populace in long-term unemployment in 2010. Within the region, Inverness has the most number of people in long-term unemployment but Wick has the highest percentage (The Highland Council, 2010).

The main issues will be around the potential additional economic activity that the project could bring and its associated employment and income, as well as any possible effects on tourism and other recreation (and associated employment). A large part of the employment and supply chain impact will stem from the construction phase. A critical part of understanding this is what is being constructed, how, by whom and where, as this will have direct potential impacts on employment and income in the area and the rest of Scotland.

Within the northern section of the Highlands, the Caithness and North Sutherland Regeneration Partnership are taking forward a regional action plan to assist diversifying the economy of the region. Projects involved in this include development at Wick Harbour, development at Scrabster Harbour, Caithness engineering, the relocation of businesses to this area, transport connections and IT connectivity (CNSRP, 2010).

The Banff and Buchan regions form the northern section of the Aberdeenshire coastline. The main population centres along the coastline are Buckie, Banff and Fraserburgh. Statistics from 2008 indicated that, within Banff and Buchan, public services form the largest employment sector followed by manufacturing and, then distribution, hotels and restaurants. Construction accounts for approximately 5% of employment. In 2007, unemployment with Banff and Buchan accounted for 27.8% of unemployment with Aberdeenshire (Aberdeenshire Council, 2008).

The development of offshore infrastructure can have an impact on the local economy through local spend, use of services and good and employment. The economic impact is likely to be most significant during the construction phase and given current programming for the development of sites, the impact will be spread over many years, and will conceivably extend up to 2020 and beyond. As well as economic benefits, wider beneficial effects will arise through the development of renewable energy, and will include reduced greenhouse gas emissions and education opportunities.

LAND USE, RECREATION AND TOURISM

The development area is bounded to the west by the eastern coastline of the Highlands and to the south by the northern coastline of the Grampians and Aberdeenshire.

The Moray coastline to the north is sparsely populated and to the south supports numerous traditional fishing villages. Local harbours support both fishing and recreational sailing activities.

It is possible that specific sectors, such as commercial fisheries, tourism and recreation, will have concerns regarding the knock-on economic effects of wind farm development, resulting from, for example, restricted access to fishing grounds or altered visual character.

Recreational and tourist attractions in the vicinity of the Moray Firth include:

Fishing
Sea angling and river fishing are both popular recreational activities in the highlands. Fly fishing, bait fishing, bank or boat, salmon, trout, rainbows, Loch or Sea.

Wildlife observations
The moray coastline is species diverse and is a favorite destination for Scotland's nature enthusiasts and for those travelling from further afield.

While the coast is focused on seabird and sea mammal observations, inland attractions include country parks such as the Highland Wildlife Park.

Walking
The highlands feature and extensive network of walking tracks. The area offers some of Europe's most spectacular and diverse wilderness areas and is of interest to walkers due to its geology, arctic–alpine flora, and wildlife.

Water sports
The Moray Firth Water Sports Association is based on the West Beach, Lossiemouth. The group offers river and sea kayaking, including trips down the river Spey and surf breaks at Sandend, Lossiemouth throughout the year.

Other water sports include sailing, windsurfing, diving, waterskiing and wakeboarding.

Golfing
The Moray Firth area features popular golf clubs at Elgin, Moray (old and new courses), Fraserburgh, Forres, Granton-on-Spey, Hopeman and Nairn Dunbar.

Nearby Inverness airport allows these golf courses to be easily accessible to Scotland's and the international golfing community.

5.3.10.2 DATA GAPS

It is considered that local, regional and national Government and other relevant stakeholder groups hold sufficient data for the region.

Further data will be obtained from the following sources:
- Annual and Mid-year population estimates
- Annual Survey of Hours and Earnings
- ONS Sub-national population projections
- BRES (Formerly Annual Business Inquiry)
- SE's regional baseline studies; consultations (to be identified as study progresses)
- Online National Statistics/Scottish Annual Business Statistics
- Higher Education Statistics Agency (HESA)
- Desk research and consultations (to be identified as study progresses)
- Visit Scotland, potentially Local Authorities which have access to STEAM data, Visitor Attraction Monitor data

5.3.10.3 Environmental Impacts Scoping

Based on available literature, the following are perceived to be the potential impacts on marine recreation and amenity as a result of works associated with construction, operation and decommissioning of the offshore transmission infrastructure:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Changes in land use. A temporary change is land use is expected within the footprint of the cable route works	✓	✓
Temporary impacts on residents related to construction activities. These will be related to noise and dust, access restrictions and include potential disruption to existing services and utilities.	✓	✓
Changes to local employment opportunities	✓	✓
Changes to expenditure within the local economy associated with goods and services	✓	✓
Impacts on economics of other marine users (e.g. fisheries or tourism/recreation)	✓	✓

The Moray Offshore Wind Farm Scoping Report was published in August 2010. The potential socio-economic impacts identified as part of the offshore wind farm scoping exercise will be considered in conjunction to the site-specific impact assessment methodology outlined below.

5.3.10.4 Site-specific Impact Assessment Methodology

For each of the potential impacts described above a survey or study and method of impact assessment is described in the table below.

Potential Impact(s)	- **Changes in land use** - **Temporary impacts on residents related to construction activities.** - **Changes to local employment opportunities** - **Changes to expenditure within the local economy associated with goods and services** - **Impacts on economics of other marine users (e.g. fisheries or tourism/recreation**
Survey/Study Proposed to Assess Impact	To determine the potential for impacts on socio-economic receptors, the following studies will be undertaken: - Review of the national and regional economy - Review of regional socio-economic strategies - Review of socio-economic impacts associated with offshore wind development - Desk research and consultations (as listed under Data Gaps above)
Method of Impact Assessment	The key method of assessment will be to undertake a literature review of available information on socio-economic receptors along the east coast of Scotland. This review will be coupled with consultation and impact assessment modelling, taking account of the planning/construction, operation and maintenance and decommissioning phases of the proposed Moray Firth development.

5.3.10.5 SITE SPECIFIC SURVEY METHODOLOGY

BEST PRACTICE GUIDANCE

Guidance on the production of socio-economic analysis of offshore wind projects has not yet been produced and this introduces two important aspects to the methodology proposed by MORL. The first is that there are considerable overlaps between the areas covered by social, economic and environmental impact assessment, and they frequently affect each other. For example, the impacts on tourism will partly depend on visual amenity and this is both economic, in that tourism may be increased or decreased which will then impact on income for tourism associated businesses and social if this then affects employment and quality of life. MORL will work with socio-economic experts, the Scottish Government and the EU partners on the GPWIND project to help produce clearer guidance on what should be covered in this type of analysis. The outcomes of these ongoing discussions will inform MORLs proposed approach to socio-economic impact considerations, as appropriate.

5.3.10.6 SUMMARY OF METHODOLOGIES

The key method of assessment will be to undertake a literature review of available information on socio-economic receptors along the east coast of Scotland. This review will be coupled with consultation with relevant stakeholders.

For our purposes the baseline would be developed using a range of socio-economic quantitative and qualitative data covering the Highland area, including parts of the Moray coast.

The socio-economic impact assessment modelling will include the planning/construction, operation and maintenance and decommissioning phases of the development.

The models would use information from the developers on where expenditure would potentially be made and broadly on what. Estimates on how much would be retained in the local area, in Scotland and in the UK will be provided. This investment would support employment to varying degrees depending on the sector and this in turn would have further effects through the supply chain. The proportion of the expenditure retained in each area will also contribute to the Gross Value Added (GVA) produced.

MORL's assessment of the potential tourism and recreation impact of the proposed developments will not seek to quantify, in financial terms, any impact on local tourism businesses. Instead, our approach will be to:

- **Review existing evidence** of how offshore energy installations have affected tourism in other areas of Scotland and further afield;
- **Assess the current profile of tourists and visitors** who travel to the local area in terms of numbers, spend, activities, reasons for visiting the region and so on;
- **Identify any direct impacts on local tourism 'assets'** (e.g. public rights of way, paths, scenic areas or so on) which the new development may cause at the different stages; construction, operation, maintenance and decommissioning. Direct impacts could include factors such as closure or diversion of access to tourism assets or the remove of those assets;
- **Identify indirect impacts on local tourism assets**. In this case, indirect impacts will mainly relate to changes in amenity through the permanent or temporary modification of land and seascapes and the visual impact of the installations and associated development. These potential indirect impacts would be identified by first undertaking an audit of the tourism and recreation assets within a certain radius and then determining the indirect impact that the new development will have on those assets;
- **Assess potential impacts on marine tourism and recreational yachting** – through consultation with appropriate representatives or businesses; and
- **Undertake a number of consultations with key tourism stakeholders and businesses** to understand their views and the potential impact it may have on tourism

5.3.10.7 Cumulative and In-combination Impact Assessment & Survey Methodologies

The methodologies and potential survey requirements by which cumulative and in-combination effects will be assessed will be agreed with consultees.

Both the BOWL and MORL projects would be included in the cumulative impact assessment. Consideration will be given to both the offshore and onshore aspects of the two offshore wind farm projects. It is anticipated that the developers will subsequently share information to enable an informed assessment of cumulative effects within their EIAs.

The cumulative effect, however, may not be the sum of the two individual projects. For the economic impact this will be reflected in the patterns of expenditure, where estimates would be expected to take account of any savings associated with proceeding with both developments. The study will have to identify the socio-economic aspects where the cumulative effects differ from the aggregate of the two projects.

5.3.10.8 Potential Mitigation Methods

Potential mitigation measures for any socio-economic effects identified will be site and region specific. The mitigation measures proposed for the development area will be dependent upon the final design of the site and the potential impacts as determined by the EIA studies. Options of mitigation will be discussed with the relevant authorities prior to ES submission.

5.3.11 TRAFFIC AND TRANSPORT

5.3.11.1 BASELINE ENVIRONMENT

This section will assess the potential environmental effects resulting from traffic and transport on the road network associated with the construction and operation of the offshore substation, offshore export cables, onshore export cables and onshore substation. Traffic generated by these will be associated with their construction and the delivery of components etc. There will not be any regular traffic generated by the operation of these and so the effects of traffic within the ES will be limited to that generated by their construction.

The assessments will be based upon the baseline environmental conditions which will be determined through a detailed site visit, an analysis of traffic flows and an analysis of Personal Injury Accident (PIA) Statistics.

5.3.11.2 DATA GAPS

It is considered that sufficient data will be available on which to undertake the assessments to determine any likely environmental effects of road traffic.

5.3.11.3 ENVIRONMENTAL IMPACTS SCOPING

Based upon experience of other similar proposals, the following are considered to have a potential environmental effect:

Impact Description	**Potential site specific impact**	**Potential cumulative and/or in-combination Impact**
Increase in Traffic	✓	✓
Movement of Abnormal Loads	✓	✓

5.3.11.4 SITE SPECIFIC IMPACT ASSESSMENT METHODOLOGY

Potential Impact(s)	**Increase in Traffic**
Survey/Study Proposed to Assess Impact	A full assessment of the traffic and transport implications of the construction phases of the offshore substation, offshore export cables, onshore export cables and onshore substation will be undertaken, in consultation with the relevant Road Departments and with Transport Scotland as appropriate. This will: - provide details of proposed access routes to the site; - demonstrate the ability of these routes to accommodate all large loads through the preparation of swept path analyses; - identify existing (baseline) traffic flows on these routes; - assess Personal Injury Accident (PIA) Statistics along the access routes in order to assess road safety; - identify the increase in traffic numbers resulting from each phase of the project; - assess the increases relative to the baseline traffic flows using criteria derived from recognised guidance (IEMA, 1993); - identify potential environmental effects arising as a result of the increased traffic; and - where necessary, propose mitigation measures to manage the increased traffic in order to minimise the resulting environmental effects, including an outline traffic management plan.
Method of Impact Assessment	Current guidance for assessing the environmental effects of road traffic is set out in '*Guidelines for the Environmental Assessment of Road Traffic, Guidance Note No. 1*', published by the Institute of Environmental Management and Assessment (IEMA) in 1993. The guidelines are based upon the forecast increase in traffic on a link resulting from proposed development and sets out thresholds upon which more detailed assessments should be undertaken. The guidelines suggest that more detailed assessments should be undertaken for links where traffic flows, or the number of HGVs, are predicted to increase by more than 30% as a result of proposed development. The guidelines suggest that in sensitive locations a 10% threshold should be used as a basis for undertaking assessments in more detail. Table 2.1 of the Guidelines goes on to state that where more detailed assessments are required the following should be considered: - Noise; - Vibration; - Visual Effects; - Severance; - Driver Delay; - Pedestrian Delay;

	- Pedestrian Amenity; - Accidents and Safety; - Hazardous Loads; - Air Pollution; and - Dust and Dirt. The environmental effect of road traffic resulting from the proposals will be assessed upon the local and wider road network in accordance with the above IEMA guidelines. Each link will be considered in isolation to determine whether it is deemed sensitive or not and the forecast change in traffic flow resulting from the proposals will be assessed against the relevant threshold, as identified by the IEMA. If any areas on the wider network route through sensitive areas, then the 10% threshold will be applied. Assessments will be undertaken across a typical working day. On any link where increases in traffic flow are in excess of the threshold a detailed assessment will be undertaken in accordance with Table 2.1 of the guidelines and set out above. The likely links which would be used to access the site are shown in Figure 5-23. Not all of these links will be used to transport material to the site at the same time, however, those being used will be assessed in accordance with the above guidance.

Potential Impact(s)	**Movement of Abnormal Loads**
Survey/Study Proposed to Assess Impact	A full assessment of the traffic and transport implications of transporting abnormal loads will be undertaken, in consultation with the relevant Road Departments and with Transport Scotland as appropriate. This will - provide details of proposed access routes to the site for abnormal loads such as those associated with the transportation of sub-station components; - demonstrate the ability of these routes to accommodate all large loads through the preparation of swept path analyses; and - where necessary, propose any accommodation measures which may be required in order for abnormal loads to reach the site.
Method of Impact Assessment	An Abnormal Loads Study will be undertaken to determine suitable routes to the site for all abnormal loads. This will comprise of a detailed site visit along the routes to measure road geometries and to rank the available routes to determine a preferred route option. Where necessary, accommodation measures will be determined to enable abnormal routes to reach the site. These routes will be discussed with the relevant Road Departments and with Transport Scotland as appropriate in order to agree suitable routes for abnormal loads.

5.3.11.5 SITE SPECIFIC IMPACT SURVEY METHODOLOGY

All assessments will be undertaken in accordance with current guidance for assessing the environmental effects of road traffic as set out in '*Guidelines for the Environmental Assessment of Road Traffic, Guidance Note No. 1*', published by the Institute of Environmental Management and Assessment (IEMA) in 1993.

5.3.11.6 ADDITIONAL INFORMATION

Access and egress solutions and route options will be subject to a full swept path analysis and further discussions with Road Authorities and Transport Scotland as appropriate.

Police Authorities, Transport Scotland and Road Departments are invited to comment on this Scoping Report, and will continue to be consulted during the EIA process.

OTHER SURVEYS TO BE USED TO IDENTIFY IMPACTS

The above methodology will not require any other surveys in order to identify any impacts.

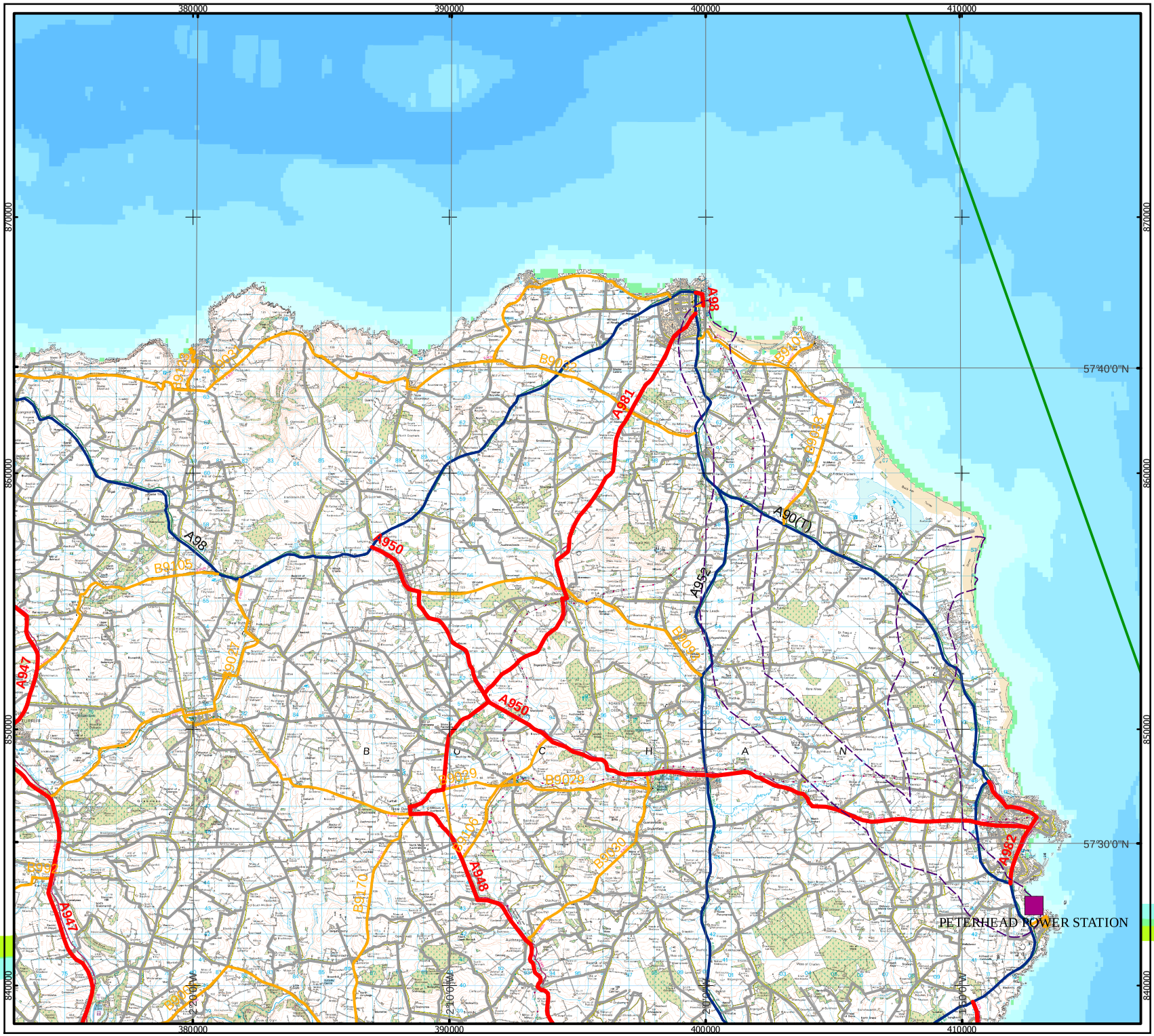
5.3.11.7 CUMULATIVE AND IN-COMBINATION IMPACT ASSESSMENT AND SURVEY METHODOLOGIES

In addition to assessing any environmental effects resulting from the construction of the offshore substation, offshore export cables, onshore export cables and onshore substation, an assessment of any cumulative and in-combination effects will also be undertaken using the above methodology.

5.3.11.8 POTENTIAL MITIGATION METHODS

The above analyses will determine the significant effects of road traffic resulting from the proposals. If any significant effects are predicted then suitable mitigation measures will be discussed with the Road Departments and Transport Scotland and implemented as appropriate.

If the Abnormal Loads Study determines that accommodation measures are required along the access routes then these will be discussed with the Road Departments and Transport Scotland and implemented as appropriate.



edp renewables

REPSOL

Moray Offshore Renewables Ltd

KEY

- National Grid Connection
- OFTO Onshore Study Area
- Motorway
- A-Road
- B-Road
- Primary Road
- Minor Road
- Railway
- Ferry Routes

Horizontal Scale: 1:200.000 A4 Chart

0 2.500 5.000 Meters

N

Geodetic Parameters: British National Grid (OSGB36)

Produced: RH
Reviewed: CR
Approved: CR

Date: 10/06/11 | Revision: A

REF: 8460001-PSO0010-MOR-MAP-020

Fig:5-23 Transport Routes

Moray Offshore Renewables Ltd

5.4 STRUCTURE OF EIA

As requested by several stakeholders, including SNH and JNCC, MORL has decided to prepare a single Environmental Statement for the assessment of the Offshore Generating Station and Offshore Transmission Infrastructure.
The Environmental Statement is likely to be presented in the following format:

Non Technical Summary

Section 1

Chapter 1 Introduction

Chapter 2 Approach to EIA

Chapter 3 Project Description
- 3.1 Offshore Generating Station
- 3.2 Offshore Transmission Infrastructure

Chapter 4 Site Selection
- 4.1 Offshore Generating Station
- 4.2 Offshore Transmission Infrastructure

Chapter 5 Stakeholder Engagement
- 5.1 Offshore Generating Station
- 5.2 Offshore Transmission Infrastructure

Chapter 6 Regulatory and Policy Context

Section 2 – Description of the Environment

Chapter 7 Physical Environment (Offshore)
- 7.1 Bathymetry
- 7.2 Geology
- 7.3 Wind Climate
- 7.4 Hydrodynamics (wave climate and tidal regime)
- 7.5 Sedimentary and Coastal Processes
- 7.6 Underwater noise

Chapter 8 Physical Environment (Onshore)
- 8.1 Hydrology, Geology and Hydrogeology
- 8.2 Noise (Onshore)

Chapter 9 Biological Environment
- 9.1 Designated Sites
- 9.2 Benthic Ecology
- 9.3 Fish and Shellfish Ecology
- 9.4 Marine Mammals

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Consultation

Stakeholders and the wider public are invited to provide comments and feedback on the Scoping Report, in addition, information on potential special constraints to windfarm siting is also welcomed.

Please direct all feedback to:

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